THE IRON TRADE REVIEW

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THE IRON TRADE REVIEW.

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IRON AND STEEL INDUSTRY, THE MACHINERY TRADE AND KINDRED INTERESTS

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CLEVELAND, O., APRIL 16, 1891.

THE WEEK IN IRON CIRCLES.

General Features. There seems to be no longer any doubt that there will be a very large export of American wheat this year. France, Russia, Germany, Holland, Belgium, India and Roumania all report a shortage, the deficit in France alone being estimated at 90,000,000 bushels; it becomes evident that, no matter how large a crop we produce, we are almost sure of a heavy export demand, at good prices. Consequent upon this will come, naturally, a renewed demand for rails and rolling stock, it being generally admitted that the railroads are simply holding back extensive orders that must come sooner or later. With this favorable outlook for the farming and transportation interests comes, also, the continued improvement of the money market, all financial reports tending to show a wholesome movement and growth of business and a decided advance in the process of recovery from the panic in September. That is the bright side of the picture; now for the more immediate and somber view, as seen in the pig iron markets. At Chicago the few sales of any size have been made, though considerable car-load business has been carried on. Foundries generally report slack work, and consumers are indisposed to buy for anything but to cover their immediate requirements. Prices remain practically unchanged, though some special lots of coke iron are being offered at cut figures, as the holders wish to realize. Lake Superior charcoals are still in small demand, but there are some inquiries from consumers who consider the present market a good one on which to buy as a matter of speculation. Trade at Detroit still continues very slow and disappointing. In fact, there is very little trade on which to base definite prices. The leading iron on the list to-day is Lake Superior charcoal, but this is the natural time for the commencement of the buying of this iron, and certain lots are being booked for early navigation delivery, and we also have learned of some transactions for delivery late in the Summer. Prices, however, are no better than they have been, but they are certainly no worse, and it is now a well-established fact that the market cannot be further pushed down. Rumors of a general strike among the miners in Ohio and Pennsylvania should have a tendency to stimulate some buying within the present month of Northern coke irons, and possibly raise figures to some extent. It is difficult to describe the Louisville market correctly, as buyers and sellers are of different views. Sales from car loads to 1,000 tons have been made the past week, 1,000 tons grey forge sold on basis of $10.25 cash at furnace, No. 2 foundry, basis $12.50, and 100 tons No. 1 foundry $14.20 cash, furnace, as basis, but as a whole, the market remains unchanged. It is reported among the pipe foundries that their business is falling off; that their orders are scarce, and prices low. It is thought that the amount of iron bought by them will be smaller than usual; a number of the larger companies at the present moment are not running full time. Car wheel irons remain firm; furnaces taking a positive stand on basis of present prices. Buyers, however, instead of purchasing in large amounts are only buying from month to month. The general conditions of the market at Cincinnati are unchanged, and in view of the unsettled state of labor no marked degree of improvement can be expected this month. If the miners' strike does not take place on May first, it is hoped that business will revive. It is evident that the furnaces do not intend to accumulate stocks of iron to glut the market, for the indicated capacity of coke furnaces now is only about half that it was in December last. A number of consumers have been making inquiries for extended deliveries, but only a limited quantity of iron has been placed. Demand at Buffalo, such as it is, seems to be very evenly distributed over a wide territory. In foundry iron, prices remain fairly firm; charcoal irons, however, are weak. That settlements are being made with greater promptness is considered to be a favorable indication for the future. St. Louis sales for the past week were limited, both in number and size. Consumers seem to have a fair supply to meet their requirements, which in themselves are not large. As to the outlook, it is difficult to determine just what the outcome may be.

The Local Situation. The absence of all activity in ore circles, coupled with the prospect of a continuation of the same conditions, is affording the people interested in the trade a full opportunity to take a vacation of indefinite length, yet one that few will care to take advantage of. Pig iron continues to be made here, and at one or two places in the Mahoning Valley, but the raw material is worked up by the makers, so that the general market is hardly affected. The ore men are earnestly working in behalf of a strong combination, the object which is the reduction to the vessel owners of carrying charges, such as dockage, trimming, etc., as shall enable the latter to make a corresponding reduction in freights to, say, a maximum of a dollar a ton. At the same time, consultations are being carried forward with the roads that carry ore to the points of shipment, with a like object. The Gogebic operators, particularly, complain of the excessively high rate of rail freight, the charge being seventy cents a ton for a 40-mile haul, which is contrasted with the coal rate, on the Ohio roads, of half a cent a mile. In the meantime, there are no sales of ore; indeed, there are hundreds of thousand tons of ore now on dock, fully paid for by the furnacemen, who do not seem to want it even shipped to their yards. Some go so far as to declare that there will be no sales of new ore until July or August. The pig iron business is correspondingly depressed, and the only visible cause is a lack of confidence on the part of consumers in the stability of present conditions, although it would require a stretch of imagination to figure on a still better opportunity for placing large orders. The reports of the Western Pig Iron Association up to date show a reduction, during the past thirty days, of some eighty thousand tons of pig iron, leaving on hand total stocks of about 250,000 tons. Of this reduction, some twenty-eight thousand tons are credited to the Shenango Valley and the Pittsburgh district, and only four hundred tons to the Mahoning Valley. It follows without saying that there must have been a large falling off in consumption somewhere. And that is the case right here, at home. There has been no practical change in the coke situation. A little coke is being made, mostly for the Pittsburgh market, and a small percentage of this supply finds it way to Cleveland, for the use of the furnaces above referred to. The threatened coal strike is apt still further to complicate the situation, in that it may lead to the shutting down of the mills within a week or two after its commencement, and so add to the lack of production even of manufactured material. Some of the foundries report business very brisk, while others, apparently on the same footing, report no business at all; but even those now engaged in turning out work have no employment beyond a week or two, while a year ago they were loaded up with orders for three or four months ahead. Bar iron is generally held at $1.60, but lower quotations obtain, here and there, for small lots, and for immediate consumption. Looking at the situation in the light of all that has been said, the outlook is anything but cheerful for all the lines entering into, or intimately connected with the ore and pig iron business. The only satisfaction that may be expressed is that arising from the fact that no worse can befall the market than what has already happened, so that the possibly worse horoscope is discounted in advance.

AS TO THE COKE QUESTION.

The Connellsville *Courier* finds fault with us for having stated in a recent number that "some of the coke interests, by what may be described as a species of bad faith, are encouraging the hands to remain firm in their unwise stand, by quoting the probable price of coke, after the strike shall be settled, at $1.75, when the men had been brought to believe that the reduction in wages was made necessary by the demand of the furnaces for $1.50 coke." The *Courier* is not fair enough to reprint this entire sentence, but chops out, instead, as much of it as serves its purpose, and then goes on to justify its criticism by personal abuse.

We have neither time nor inclination to quarrel with the Connellsville exponent of the cause of coke, but if it will give the *Courier* any satisfaction we will repeat our statement quoted above, with the assertion that it meets the case exactly. The coke men may, or may not, have harbored secret designs, when the strike began, to make the price $1.75, or still more. Certain it is, that their professions to the furnace interests were all in the line of $1.50 coke, and that they well knew the wants and demands of the furnace interests in this matter. A little while prior to the strike, coke was reduced from $2.15 to $1.90. This reduction, however, did not meet the view of the furnace interests, and the shut-down was agreed upon.

If the coke producers shut down their works simply because the furnace men did, why should they have announced a cut of 10 per cent. in the wages of their men? If their lock-out was not in the interest of the furnaces (and thus, in an indirect way, in their own) why this announcement of a reduction in wages? May it not be presumed, and fairly so, that the coke operators, no longer able to ask an outrageous price for their product, induced the strike as a counter-move to the aggressive policy adopted by the furnaces, pretending, at the same time, that their action was the result of, and acquiescence in, the steps taken by the furnaces?

If the coke men never intended—and the *Courier*, their especial organ, asserts that they never did—to sell coke at $1.50 a ton, then they may justly be charged with having acted in bad faith, and so, by misrepresentation as to their own needs in regard to the furnace interests, with having willfully prolonged a lock-out that was begun, ostensibly, to aid the furnaces, but, as now appears, to enable the operators to produce more cheaply, at the expense of labor, coke that is to be sold to the furnaces at a reduction so slight that it can hardly be taken into consideration.

Whenever the Connellsville *Courier* shall again feel anxious to air its knowledge upon the subject of coke, we shall be pleased to enlighten it.

THE TWO VALLEYS AND THE PROPOSED SHIP CANAL.

The present depression among the Mahoning and Shenango valley furnaces is taken as an opportune time by the advocates of the proposed Pittsburgh and Lake Erie Ship Canal to urge the importance and advantages of that enterprise. As the major premise of their syllogism they lay down the proposition that, in order successfully to compete with Southern irons, the furnacemen of Western Pennsylvania and Eastern Ohio should be enabled to reduce the cost of the production of pig metal in those districts, so that Bessemer may be sold, with a living margin of profit, at a price below $13 per ton.

In the reduction of first costs, of course, the material lowering of freights must play a most important part. To the solution of the problem a well-informed correspondent of the Sharpsville (Pa.) *Advertiser* contributes a series of calculations that are of much interest to iron manufacturers, and we accordingly quote liberally from the article below. After calling attention to the wonderful development of the Southern iron-making industry, the writer concludes that the production in Alabama has nearly, if not quite, reached high-water mark, and that any future increase must now come from Virginia and other Northern-Central States. He then goes on to say:

Thus far, however, the product of the entire "South"—Alabama, Tennessee, Georgia, North Carolina, Virginia and Kentucky—does not equal that of Allegheny County alone. The Southern group produced in 1890 no more than 1,447,697 net tons of coke and bituminous metal, while Allegheny County produced 1 497,786 net tons of coke metal.

We have not taken charcoal iron into account in this paper. The charcoal iron industry is of large importance, in various ways, but it occupies a field of its own. Incorporation of the statistics of this industry with those of the coke and anthracite industries, is inexpedient.

Charcoal iron, then, being out of the calculation, the champion district (Allegheny County and our two valleys, the Mahoning and Shenango), produced in 1890 28 35 per cent. of the entire pig iron output of the United States.

Pennsylvania and Ohio produced 57.67 per cent. of the whole output of 1890, and Pennsylvania alone produced 45.43 per cent of the whole output.

The output of the Shenango and Mahoning valleys was 1,224,857 net tons, of which the Shenango Valley made 669,608 tons. The two valleys made 99,380 tons more than Alabama and Virginia combined.

We are in the front rank yet; but, in order to keep there, we must reduce the cost of producing iron, at least to the degree above indicated.

We need to make iron at a cost, per ton, for labor, $1 60; administration and taxes, 80 cents; ore, $6.75; coke, $2.30; lime, etc., 55 cents; total, $12 00. And this without unduly calling for reduction on prices of stock. But we cannot do this without our ship canal.

In 1890, the average freight charge on ore (aggregating the Ashland, Marquette and Escanaba business, and including dock charges), to Pittsburgh, was $2.18⅓ per ton; to the valleys, $1.75 83 per ton.

Were the ship canal in existence, even with a through "toll" of 20 cents per ton, and toll of 10 cents per ton to Sharpsville, the rate from upper lake ports to Pittsburgh would not exceed $1 59, and to Sharpsville $1 33 per ton. So the freight on the ore for a ton of metal would be to Pittsburgh $2.58⅜, and to Sharpsville $2 16⅛ (1⅝ tons ore to ton of metal).

The reduction from present cost would be 69 6 cents per ton of metal for Sharpsville, and 96.4 cents per ton of metal for Pittsburgh.

The Pittsburgh reduction would be 26 8 cents, per ton of metal, greater than the Sharpsville reduction. The freight on the ore for a ton of metal to Pittsburgh would be 42¼ cents greater than the freight to Sharpsville; at present it is 63¾ cents greater.

But the canal should be "free," and it will be if the communities interested promptly take joint action to that end.

With a "free canal," the through rate on ore from upper lake ports to Pittsburgh will not exceed $1 39 per ton, and to Sharpsville $1 23 per ton. Then the freight on the ore for a ton of metal will be: To Pittsburgh $2 25⅞, and to Sharpsville $1.99⅞. Reduction from present rates (per ton of metal) 85 8 cents to Sharpsville, and $1 29 to Pittsburgh.

By adoption of proper cars and appurtenances, for delivering and handling stock to and at furnaces, a saving, upon present practice, of at least 15 cents per ton of metal may be effected.

By the very simple expedient of taking out of the blast-air, before it goes into the blowing-tubs, all water that may be removed by condensation, a saving of fuel (and increase of production per diem) may be effected, equivalent, with coke at $3 per ton (in the furnace) to 30 cents per ton of metal produced. The saving effected by the desiccation of the blast-air, with a furnace making, in present practice, 100 tons per diem, will repay the cost of the desiccating plant in about seven months. The above specified reductions of cost to be effected by the canal, and the other means here named, amount to $1 308 per ton of metal made. The canal would operate furthermore to materially modify rates on coke, and to reduce cost of transportation of pig metal; the latter result working as directly for the benefit of the furnaces as would were it an actual reduction of cost of production.

Whatever be said of the feasibility of the canal project (and that the Pennsylvania Legislature deems it feasible is evident from the fact that it has continued the Canal Commission in service), the argument of cheaper rates, is a seductive one, and stranger things have happened than the materialization of a scheme which now seems so visionary.

ARMOR PLATE AGAIN.

The international discussion of the comparative advantages of French, English and nickel-steel armor plate still keeps up. The most recent contribution to the literature of modern armament is a paper by M. J. Barba, late engineer in the French navy and chief engineer of the Creusot works, read at a meeting of the Institution of Naval Architects (London). In this paper M. Barba gave an interesting history of the improvement of steel armor, but his paper was chiefly conspicuous for the absence of any description of the process by which the French steel-makers have been enabled to produce the best shot-resisting plate in the world. Certainly nothing was contributed to either the paper or the subsequent discussion to show that the United States (which was first, we believe, to publicly demonstrate the great superiority of the Creusot plate and nickel steel, and to adopt the French process of steel armor-making) is not on the right track. To be sure, the representatives of two great English firms manufacturing armor plate still held to the superiority of the English compound plate, but the results of the recent trials at Annapolis were all the other way.

One rather amusing feature of the discussion was the reference by Mr. J. F. Hall (of the English Nickel Syndicate) to what he described as "the unfortunate publicity" given to the trials of nickel plates at Annapolis. When those trials took place he was, he said, on his way to America with the members of the Iron and Steel Institute, and scarcely had their vessel weighed anchor when a telegram was sent to the United States, saying that they were on their way to buy up all the nickel in this Continent. The result, of course, was an immediate "boom" in nickel, the fever to possess large supplies of the metal being so great that Mr. Secretary Tracy was immediately empowered by Congress to make enormous purchases before the arrival of the Englishmen. Since then, it appears, nickel has advanced considerably in value, and it is likely to become still more valuable, as all experts admit its remarkable qualities as an

ingredient in ships' armor plates. To say that the "Yankees" stole a march on their English brethren would hardly be gracious, but it has that appearance, to say the least.

IT is highly gratifying to learn that the Inman and International Steamship Company is preparing to build two ocean greyhounds, to cost $2,000,000 each, and that it is highly probable that both of them will be built in Philadelphia. If this expectation is realized, they will both be manned by American seamen and will fly the American colors, and promise to be the first of twenty-nine similar ships which will contest with French and English steamers the cream of the passenger traffic between the United States and Europe. But we do not observe that the anti-subsidy journals are overly pleased with the prospect. It goes so against their theories, you know.

WE doubt not but that the time will come when the tinplate manufacturing industry will be established in America. Improved processes of manufacture lessening the amount of manual labor employed, and cheaper labor [!] in America will gradually effect what the McKinley bill utterly fails to accomplish.—[Iron and Steel Trades Journal (London).

The admission of our London contemporary is frank, but its disinclination to give the McKinley tariff any of the credit shows a woful perversity of judgment.

"FREIGHTS [in the South] on furnace materials for the same distance hauled are about 50 per cent. less than the charges in Ohio and Pennsylvania," says the Chattanooga *Tradesman*, which ought to know. Northern railroad managers will have to come down from their high horses or they may live to rue the day.

SCANT praise is given the samples of American tinplate sent the leading London trade journals. It is "neither very good" nor "so bad that it might be worse," and so on *ad infinitum*. In the meantime the establishment of the tinplate industry in the United States goes steadily forward.

AGAIN the *Un-American Artisan* is called to book for its wild assertions regarding the evil (?) effects of the McKinley tariff. This time it is a Missouri subscriber who writes to the paper. If this thing keeps on, the *Artisan* will have to employ an Indignant-Subscriber Editor, sure.

WAR AMONG THE AXE MANUFACTURERS.

In a review of the axe market in the last number of *Hardware*, some brief outlines were only hinted at, rather than a full explanation of the really peculiar condition of affairs. No event in hardware trade circles of recent occurrence has excited such widespread comment, and its almost sensational features have escaped the attention of the public press only because of the very quiet methods the factors in the warfare have adopted in its conduct. For, beneath the calm and apparently quiet condition of the trade, a "warfare" as bitter and uncompromising as it would be possible to conceive of has been raging with an intensity of feeling so great that it has been with no little difficulty that the jobbing trade has been able to stand aloof from it.

The situation is now such that *Hardware* can state more in detail what was really hinted at in its recent review of the facts. The formation of the American Axe & Tool Co., in 1890, did not include some large and influential concerns. Among them were the Collins Axe Co., H. Knickerbacker, Kelly Axe Manufacturing Co., A. G. Peck & Co., Danu Edge Tool Co., and the Ten Eyck Edge Tool Co. The American Axe & Tool Co. made a sort of an agreement with each one of these concerns, by which uniformity of prices was observed, and a heavy advance made in axes in 1890, against the protest of many makers and the emphatic objection of the jobbers. During the year several old factories which had been shut down were refitted and several new concerns started up, so that at the close of the season the American Axe & Tool Co. were confronted by not less than 19 competitors, with an aggregate capacity of over one-half the entire domestic consumption of axes. This did not include the factory of H. Knickerbacker, at Ballston Spa, N. Y., which they had absorbed, leaving them in possession of what were supposed the best selling brands of axes. They were not blind to the situation. It had been clearly pointed out to them by one of the most active of the outside manufacturers, who had been confining his product to a patented specialty in an axe which commanded a distinct place in the trade.

In looking over the trade he realized that so much competition, unless restrained, would eventually reduce prices unduly, which would, of course, affect him. He made a visit to each of the outside concerns and soon convinced them of the necessity of pledging to some scale of prices to prevent a ruinous cut. He met with a ready and willing response, and soon was able to report the result of his labors to the American Axe & Tool Co., to the effect that the outsiders would meet on a fixed day and agree on a mutually satisfactory scale of prices and submit their books to a monthly inspection of a Commissioner, and in this way prevent the necessity of a decline. He was cordially received by the officers of the American Axe & Tool Co., and several satisfactory interviews were held. In deference to the anti trust law, it was agreed that the President of the American Axe & Tool Co. should receive a personal notice of the proposed meeting, and be notified unofficially of its results. The gentleman who arranged it was requested to go ahead and call the meeting and make arrangements on this basis, with the understanding that no prices would be made until after it was held. Circulars were accordingly sent out calling the meeting. This was the plan of campaign of the outsiders. Apparently it was moving to perfect success, and everything augered well for the success of the movement. But in the councils of the American Axe & Tool Co. a far different plan was being perfected. While some of their officers were parleying with the outsiders and keeping them from action, the rest were busy with an elaborate scheme for their complete overthrow. It looked exceptionally feasible and certain of success, was in brief as follows:

Controlling the brands of axes which they supposed to be indispensable, each of the large jobbing points from the Pacific to the Atlantic was visited by their agents. After each man had reached his post ready for work, a simultaneous onslaught was made on the trade with a confidential and heavy cut price, the rebate, however, being allowed on sole condition of the jobber confining his sales exclusively to the American Axe & Tool Co. As we stated in the last number of *Hardware*, these prices were graded according to the factory whence the axes were obtained. As the popular brands were supposed to be absolutely indispensable, and as the rebate was heavy enough to make it a necessity also, it certainly looked as though this would effect a complete "freeze-out" of all the outsiders.

For over a week this plan was carried out in all its details, while the outsiders were being lulled into inaction by the proposed meeting in the future. The orders from the jobbers, however, were not obtained. Two wholly unexpected, but potent, obstacles arose to completely check this elaborate campaign.

The first was the refusal of the jobbers to be dictated to, and the second was the immense strength with the trade developed by the patented axe referred to.

On this account jobbers insisted upon hearing from the outsiders before buying. Some of the largest of them went so far as to declare that if the issue was forced of dropping the old brands and the patented new one, they would unhesitatingly buy the new axe. The manufacturer of this article was soon notified of the state of affairs, and the amazement of all the outsiders may well be imagined when the situation dawned upon them. A circular was at once sent to the trade, advising them to wait for outside quotations before buying, and it had the effect of at once checking the operations of the Trust. In order to do anything at all, the latter were forced to withdraw the clause in their contracts forbidding the purchase of outside goods, as in many instances their insistence upon it would have had the totally unexpected result of shutting them out, owing to the strength of the patented axe. It was strongly intrenched in every market of the country, and the sales of it under the market brand exceeded the maximum sales of the most popular brands of the older company.

Of course this situation made it difficult for any orders whatever to be placed with any certainty. The jobbers were naturally desirous of being recompensed for the "squeeze" to which they had been subjected the preceding Spring, and were inclined to hold off while the "pot boiled," as one aptly expressed it.

At this writing the contracts cover about the needs of the most popular brands of the combination, and, perhaps, the entire product of the patented axe. The smaller outsiders and the obscurer factories of the older company are now fighting it out at the prices which will realize little or no profit to the firms securing the trade.

Two at least of the outside companies mentioned above, besides the one making the patented axe, can show contracts covering perhaps their entire capacity, but from present indications it looks as though some of the smaller outsiders and some of the small shops of the American Axe & Tool Co. will be closed for want of work. The whole affair has been one of unusual interest to the trade at large, and no little comment has been made from all quarters on the methods adopted by the participants to fight each other.—[Hardware, New York.

Huge Lathes and Cranes Operated by Electricity.

The United States government has given an order for eight lathes to be used for trimming and boring guns. They will cost over $400,000, and an idea of their size may be formed from the fact that one of them will weigh 250 tons. The firm to whom this order has been given is using electricity for the operation of several large traversing cranes capable of carrying 20 tons or more, in its shops. These cranes are operated by current from a dynamo, and to the uninitiated it is difficult to realize that the prodigious power necessary to move such masses is all conveyed through a wire not thicker than a slate pencil. The bridge can move on the "run-way" at the rate of 200 feet a minute and the trolley, while running back and forth on the bridge at the rate of 100 feet a minute, can wind up the chains with a load attached at the rate of 40 feet a minute.

The Condensation of Steam in Pipes.

It is sometimes convenient for an engineer to be able to approximate the amount of condensation that will take place in pipes during a certain length of time. From many experiments made on the condensation of steam in wrought-iron pipes when exposed to the open air it is found that 1 lb. and 6 oz. of steam per square foot of pipe's surface was condensed per hour when the difference in temperature between the steam and air amounted to 200°. As this is very nearly the difference of temperature usually found between the steam in the pipes and the air on the outside, this simple rule will give results sufficiently close for ordinary purposes.—[The Stationary Engineer.

HEAVY stocks of iron ore are accumulating at Bilbao, and as there is little prospect of larger shipments, men are being paid off, and it is probable that some of the mines will be temporarily closed.—[Iron and Steel Trades Journal, London.

LAKE SUPERIOR MINING NOTES.

MARQUETTE RANGE.

There is no truth in the rumor that negotiations are pending looking to the purchase of the Michigamme mine by the Champion Iron Co. A small quantity of ore from the Champion mine is being treated by the Venstrom separator owned by the Michigamme which in some way seems to have given rise to the rumor of contemplated sale.—[Florence Mining News.

MENOMINEE RANGE.

The work of sinking at No. 2 at the Hamilton is again being pushed rapidly and it is expected that during the present month a good record will be achieved. Only a few feet were sunk last month owing to the large amount of other work which was done in the shaft.—[Menominee Range.

Work has begun on section 8, and the drill hole which was put down something more than 300 feet a few months ago, will be drilled to a depth of at least 500 feet, or until something of value is struck.—[Menominee Range.

The ore dock at Escanaba, Mich., known as the Schlesinger dock, in connection with the Escanaba, Iron Mountain & Western Railway, which recently passed into the hands of Eastern capitalists, and will soon be controlled by the Northwestern railway, is nearing completion and by April 25, the largest ore dock in the world will be ready to receive its first cargo of ore for lake shipment. This dock is 52 feet high, is reached by a trestle 800 feet long of the same height from the shore; the dock being 1,422 feet long and containing 232 pockets of 180 tons each capacity, making a total capacity of 41,760 tons, a capacity of over 6,000 tons more than the largest dock in the United States. Mr. E. C. Haledge, resident engineer, having had the very best of material, selected both of iron and wood, has given his personal attention to the construction of the work and deserves the right to feel proud of its success. The contract for the construction was let to R. B. Dear, formerly of the firm of Dear & Hayes, Minneapolis, who had built all the coal and merchandise docks at the head of Lake Superior, both at Duluth and West Superior, in the last five years, and he has completed the work in a very short time. For not until January 5 and 10, of 1891, was there any work done either on the approach or dock above the sills, and over 7,000,000 feet of timber have gone into place, besides several hundred tons of iron since that time. He has also broken the world's record in hanging car shutes, 232 shutes being hung by one single crew of eight men in seven and one-half days, an average of 31 shutes per day, but as high as 41 were hung in one day. A. R. McDonald, of Minneapolis, as superintendent for Mr. Dear on this dock, has full control of the whole supervision of the work, and his excellent judgment and management has been seen from the start. Escanaba now flatters herself as being the king port of the world for ore shipping. Nearly double the capacity for handling the ore of any other port on the chain of lakes, but it seems almost unreasonable that the Northwestern alone controls the entire shipment from this point. If the energetic people of Escanaba would put their heads together and give other roads some inducement or build a road of our own to break the monopoly, we would see our town change from a quiet lake port to a thriving city.—[Sentinel.

VERMILION AND MESABA RANGES.

A gentleman who came down from La Prairie, brought news of another rich discovery of iron ore on that end of the Mesaba. The property is eleven miles from La Prairie, in section 21, 56 24, and is owned by the Dismord Mining Co., of Minneapolis. The find was made on March 26, by Harry Klages, the explorer of the company. The gentleman who gave the *News* this information made a personal inspection of the property, and he reports the ore of an excellent quality, and the showing good for a large deposit. Klages sank an eight-foot shaft 70 feet, when his efforts were rewarded by striking what appears to be the main lead of the very best quality of soft hematite ore. This was done Thursday, March 19; by Friday he had gone four feet into it. The deeper he went, the better the quality proved to be. The ore was found in the southwest corner of the shaft. The lead appears to dip from the northwest to the southwest of the range, at an angle of 45 degrees. By Saturday night six feet of the ore had been gone through, and as to its quality, experienced miners such as Captains Morcom and Fay, of the North Star Mining Co., give their unqualified opinion that it is of the very best found on the range. Captain Morcom, who is well known in Duluth, said to the *News'* informant: "This ore is of the very best quality, and the best I have seen on the range. I am just as jubilant over this find as if I had got it myself. If the quantity is equal to the quality, you will see the biggest kind of mining operations carried on along the range. This encourages us all very much indeed. It is really something to enthuse over."—Duluth News.

Plate Rolling at the Krupp Works, Essen.

The metal from which plates are to be formed is prepared by the Siemens-Martin process; it is cast in rectangular forms, and then, without any preparatory hammering, is taken directly to the rolling mill. Here we find three rollers arranged one above the other. The longest rollers turn out plates nearly three yards wide. There are automatic tables for raising and lowering the plates in their passage from one set of rollers to the other, and automatic devices for guiding them as they pass between the rollers or are taken from them. The man in charge uses a whistle in giving the signals which direct these movements, and without the help of tongs or levers the glowing blocks move back and forth between the rollers. The men standing on both sides of the rollers have to only wipe off the plates with brooms and occasionally turn the plates. The cooled plates have to be straightened and cut according to the size and shape desired. Immense shears with long steel blades cut through these plates as easily as ordinary shears cut through paper. Very thin plates are also rolled here. Lately a new rolling mill has been put in operation in these works which is much larger than those mentioned and is not, in fact, surpassed by any in the world. It is for rolling armor plates, and turns out the heaviest plates in this description that can be required in any navy, that is, plates about 28 inches thick and nearly four yards wide. Some idea of the dimensions of this machine can be obtained from the statement that each pair of crucible rollers, when in a rough state, weighed 100,000 pounds. The entire rolling mill with its reversing engine, the large furnaces, the cranes, that can move 300 000 pounds, its bending presses, and numerous other machines used in working and adjusting the plates, forms in itself a large plant. These are, of course, only two of the many interesting processes to be found at these works.—[Illustrirte Zeitung.

THE SYDNEY STEEL SCAPER CO.

The Sidney Steel Scraper Co., of Sydney, O., so extensively known throughout the whole country, manufacture what is known as a contractor's solid pressed steel tray barrow for handling earth, sand, brick and mortar, also for levee and canal work. The tray is pressed from a single piece of steel, 16 gauge, and is mounted on a wooden frame and iron wheel. The frame is planed smooth on all sides; the lumber selected with care and well painted. The tray is smooth, can never split as a wooden tray does, consequently supports the frame much better, and saves many times the first cost of the barrow in avoiding breaks and delays at busy times. It is a well-known fact that the keeping of a poor barrow in repair is much more than the original cost. This barrow is well braced throughout. The brace on the leg extends around the bottom or base, and prevents splitting. A trial of this barrow is self convincing of its worth.

The wheel has a ⅝ bearing, 1½x⅜ tire steel spokes (½ inch in medium wheel and 9 16 inch in extra heavy wheel) malleable iron hub, and is 17 inches in diameter. This wheel can be relied upon, and it is claimed no better barrow wheel is made by any one. The bearing is a piece of ⅝ round iron, driven through the malleable iron hub, and when worn out can be easily replaced, costing no more than a bolt, which is more liable to bend and make the barrow run hard. A strong rivet passes through the hub between each spoke.

They also manufacture what is known as Haslup's Improved Drag Scraper. This scraper is made of a single piece of steel of peculiar shape, and so bent as to be free from sharp corners and angles, having no place where the dirt can collect and stick fast. It is so constructed that the portion forming the back passes upon the inside of the sides, where it is firmly held by two bolts passing through both the sides and end, and in connection with the clamp, forms the fastening for the upper portion of the handle. The other fastening is similar, and so adjusts itself to the handle as to form a perfect and secure device for holding it in place. One of the most important features of a drag scraper for the user to take under consideration when purchasing, is the protection of the bottom from wear. To accomplish this, they have securely riveted upon the bottom two steel runners, so shaped as to insure the greatest cleaning capacity, and, at the same time, reduce the friction to its least possible resistance. The Sidney Steel Scraper Co. manufacture one of the largest assortments of scrapers, barrows, etc., in the country, and the amount of work which they are constantly getting out goes to show that their goods speak for themselves.

POCAHONTAS-FLAT-TOP COAL AND COKE.

From an interesting and exhaustive article on the above subject by Mr. Jos. D. Weeks, in the *American Manufacturer*, we take the following, adding new data covering the year 1890:

There is no more interesting and important coal field in the country to-day than that known in its early history as the Pocahontas, from the mining town where the first important developments were made, and then as the Flat-Top, from the great Flat-Top mountain in which the measures are found, but which is now known accurately as the Pocahontas Flat-Top field, but called usually the Flat Top.

This region has been so often and so thoroughly described that it is not deemed necessary in this article to refer to it except in the briefest manner possible.

It will be regarded as a district for the production of coke, and its coal chiefly as a material for coking, though, to properly discuss its advantages as a coking district, it will also be necessary to pay some attention to its production of coal for other purposes.

The statements are the result of a visit to the region and a careful investigation of its resources, their utilization and their promise for the future.

GEOGRAPHICALLY.

Geographically, this field is located, so far as the measures have been worked, in the counties of Tazewell, in southwest Virginia, and Mercer and McDowell, in southeastern West Virginia.

This field can be divided, roughly, into—

1st. The *Pocahontas District*, including the workings at or near the town of Pocahontas, Virginia.

2d. The *Bluestone District*, including the workings on the Bluestone, near Bramwell, in Mercer county, West Virginia, on the southeast slope of Flat-Top mountain.

3d. The *Elkhorn District*, including the workings in McDowell county, West Virginia, on the northeast slope of the Flat-Top mountain, on the head waters of the Elkhorn.

This mountain is the most conspicuous and important feature of this region. Numerous streams find their source on its sides, run rapidly down a short distance, and then follow a sluggish course with moderate fall. High ridges between these streams hold the coal beds. The valleys are narrow, usually, with steep slopes.

OUTLETS.

The field is reached by the New River branch of the Norfolk & Western Railroad, which leaves the main line at Radford, 43 miles southwest of Roanoke, the junction of the Norfolk & Western Railroad with the Shenandoah Valley Railroad. This latter road connects through the ore regions of the Shenandoah Valley, via Hagerstown, with Central Pennsylvania. It is 74 miles from Radford to Pocahontas; the same distance to Bramwell, the center of operations in the Bluestone regions, and 82 miles to Elkhorn, the terminus, at present, of the Elkhorn extension of the Norfolk & Western Railroad.

This latter extension will be carried down the Elkhorn, and probably down the Guyandotte, to the Ohio, at Ironton. At Bluefield, 65 miles from Radford, the Clinch Valley Railroad, which will connect with the Louisville & Nashville, at Big Stone Gap, branches off.

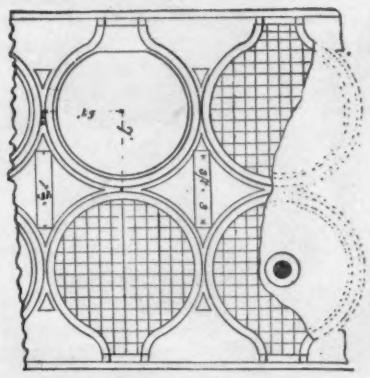


FIG. 2—PART PLAN OF OVENS.

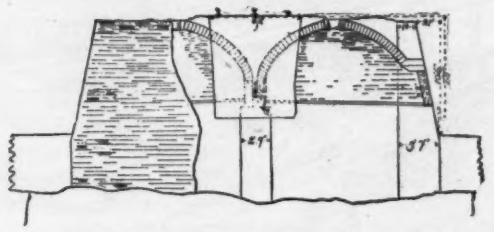
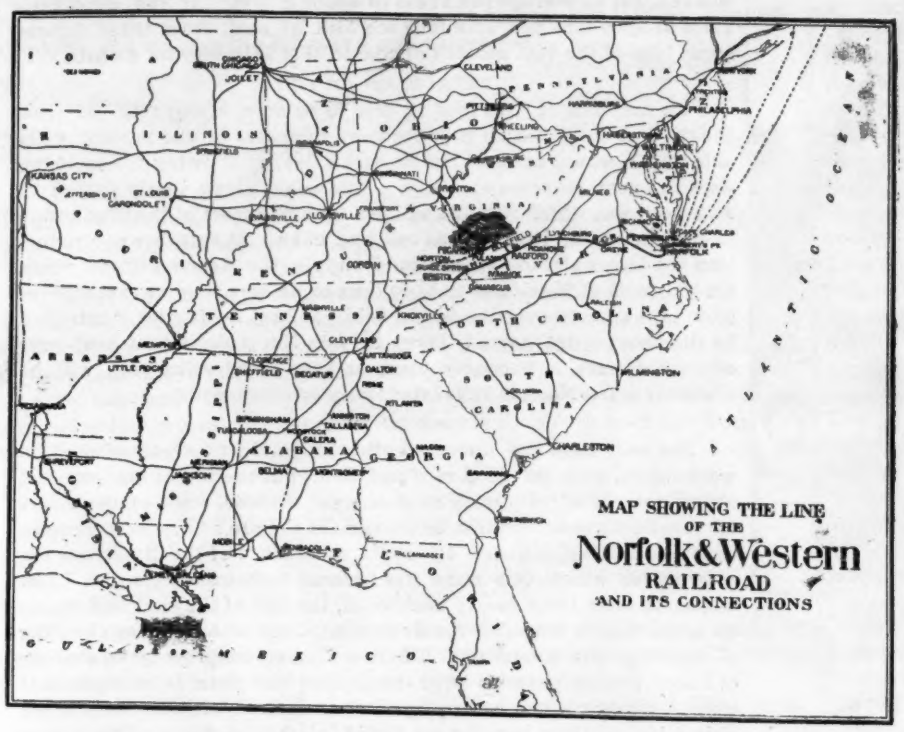


FIG. 3—PART TRANSVERSE SECTION, PART END VIEW AND ELEVATION OF PIERS.



To the energy and push of the officials of the Norfolk & Western Railroad is due the rapid development of this great coal field. The main line of this road runs from Bristol, Tenn., where connection is made with the East Tennessee, Virginia & Georgia road to Norfolk Va., at the mouth of the Chesapeake Bay, where they have one of the finest harbors in the country, at which point large and extensive coal docks have been erected. The road is under the management of Mr. F. J. Kimball, President; Mr. Charles G. Eddy, Vice-president, in charge of traffic department, and Mr. Joseph H. Sands, General Manager, in charge of the transportation department. It will thus be seen that there are most excellent transportation facilities for the distribution of the coal and coke of this region, not only to the furnaces and the works of Virginia, but to all points through the South and Southwest and, when the Elkhorn extension is completed, to upper Ohio river points and Lake Michigan ports.

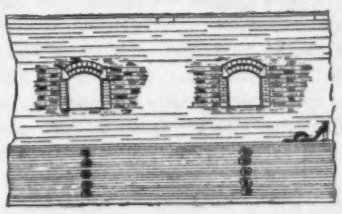
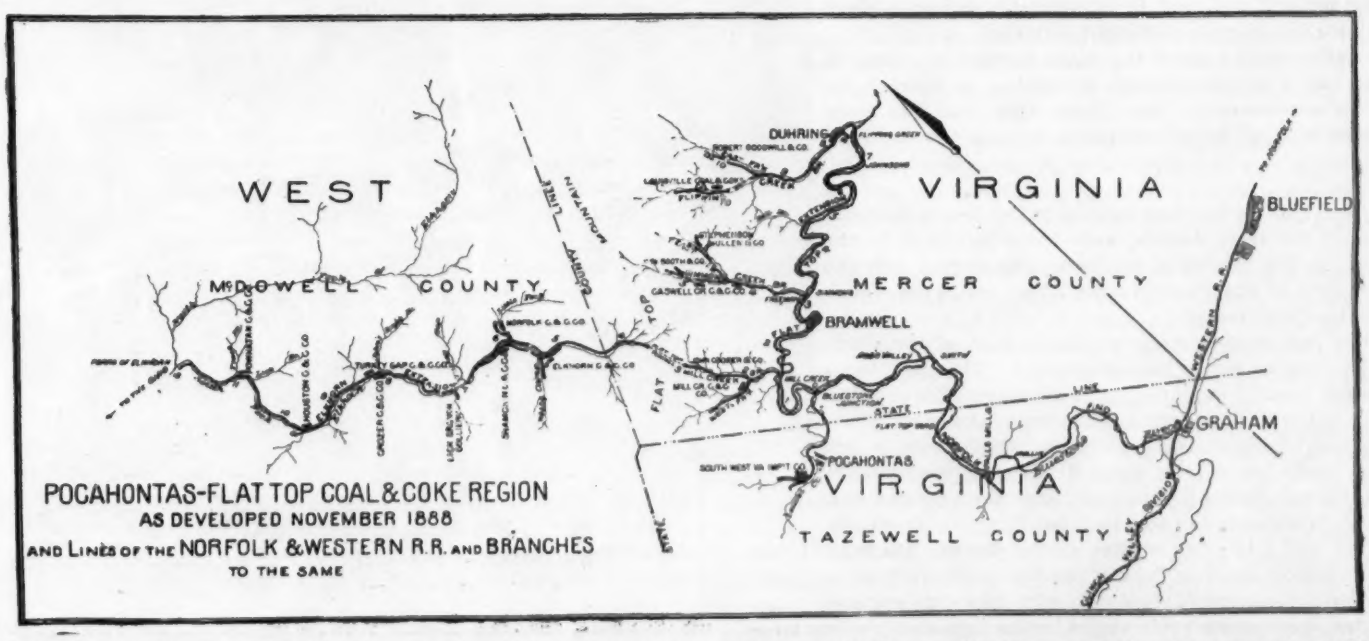


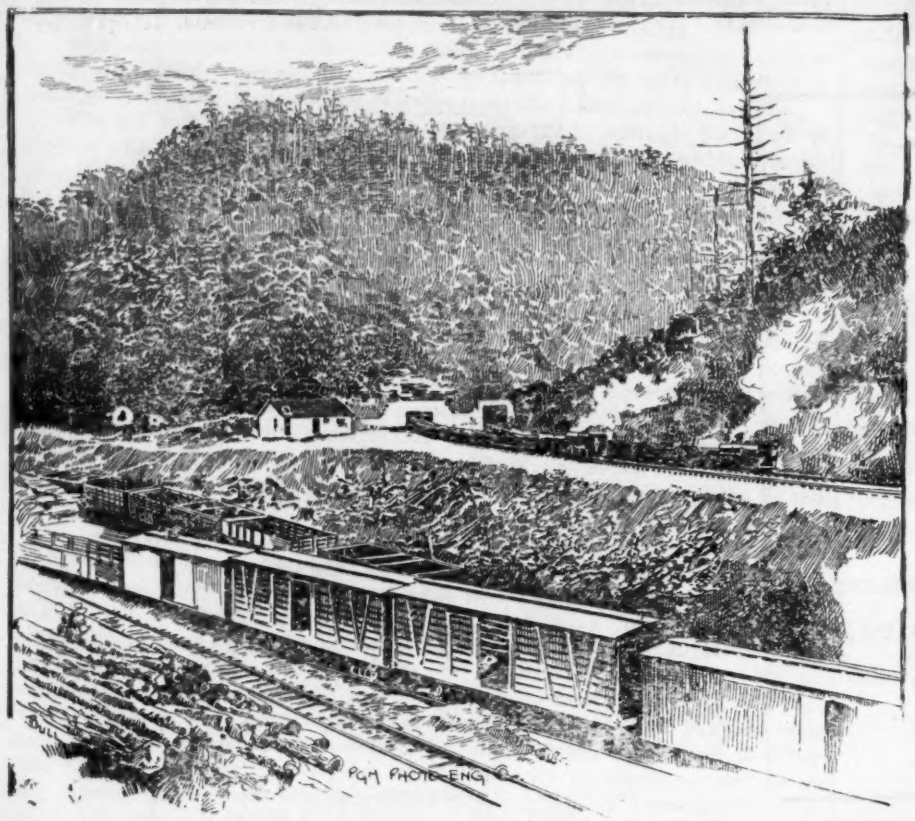
FIG. 1—FRONT ELEVATION OF OVENS.



OWNERS AND LEASES.

Until April 1, 1887, the territory east of Flat-Top mountain was owned by

everal coal companies. At this date these were all consolidated into what is known at the Flat Top Land Trust, which now owns most of the lands with the exception of those owned by the Crozer Land Co., on the Elkhorn. The Trust owns 10,000 acres in Tazewell county, Virginia, including the Pocahontas lease of 3,800 acres; 45,000 acres in Mercer county, West Virginia—the Bluestone district; 55,000 acres in McDowell county, West Virginia—the Elkhorn district; and over 90,000 acres in Wyoming county, on which no leases have yet been made. The Crozer Land Co. owns 16,000 acres. The lands of the



two companies are so interwoven onthe Elkhornthat the ysquared the connecting tracts and organized the South Elkhorn Coal Co., the two companies jointly forming this company, on whose land four leases have been made. The Crozer Land Co. also have lands on the Elkhorn other than these in the South Elkhorn Coal Co.

No land is sold, all being held and worked by the operators under lease. Even the Southwest Virginia Improvement Co., which was one of the first to mine coal in this region, and which is the only operator in the Pocahantas district, sold all of its land to the Trust, when it was formed, and became a essee under practically the same terms as the other companies.

The royalties are from 6 to 10 cents a ton (2,240 pounds) of coal sold as coal, and 12 to 15 cents a ton (2,240 pounds) coke produced. The standard royalty of coal is 10 cents, and 6 and 8 cents royalty being paid in the northern part of the field where the vein is smaller than in the southern part. A minimum payment of $7,500 per year is required from each lease. There are at present, including those given by the Crozer Land Co., 15 leases in this field: 1 in the Pocahontas district; 6 in the Bluestone; 4 on the land of the South Elkhorn Land Co., and 4 on the land of the Crozer Land Co.

The total land covered by these leases is only about 10,000 acres of the 216,000 acres of coal land in this district, and only about 9,000 acres of the 162,000 actually underlaid with coal.

The Land Trust employs a mine inspector to visit all parts of the mines and see that a proper system of mining is carried on, and that no coal is unnecessarily lost. Since this coal has made such a fine grade of coke all leases now given require the building of 100 coke ovens.

GEOLOGICALLY.

Geologically, the coals of this field belong to the lowest member of the coal measures, No. 11 of Rogers, and are equivalent to the Quinnimont series of the Kanawha or New river region and the Pottsville-Conglomerate of the Pennsylvania. The series has been called the Pocahontas-Quinnimont.

There are in this field at least three workable beds above water level. No. 3, the Pocahontas bed, is the one worked. This bed has a workable thickness of from 11 to 13 feet at Pocahontas, though the whole thickness is not mined, a portion of the top of the seam being left for the roof, and in some cases a portion of the bottom is left for the floor. The thickness of the same diminishes towards the northwest and northeast from Pocahontas. On the Virginia line is about 11 feet and diminishes to 5 to 6 feet on Flipping creek, in the Bluestone region, and 4 to 5 feet further north. On the Elkhorn it is from 7 to 9 feet, and on the Tug Fork of the Big Sandy from 6 to 10 feet. This wonderful coal seam is absolutely without a slate parting. It is split up into two distinct workable seams by the thin streak of bone coal quite rich in carbon. This has been called a slate parting, though improperly so. This bone coal increases in thickness northward, reaching 6 or 7 feet on Flipping creek, dividing coal bed No. 3 into two seams. The seam is also free from all faults. Clay veins, spars, rolls or horse-backs are never found in it. Everything handled by the miner is placed in the wagon, excepting, that in the Elkhorn district: a small streak of "bone coal" is found near the top which is condemned by the inspectors, and has to be thrown out. Certain portions of the coal at some openings that have been discolored by water, termed "rusty coal," are also thrown out by the inspectors, though analysis shows it to be equal to coal not thus discolored.

EXTENT OF THE FIELD.

This coal field occupies a very large area in Tazewell county, Virginia, and in Mercer, Wyoming, McDowell and Raleigh counties, West Virginia. In this territory there are nearly, if not quite, 216,000 acres owned or controlled by the two chief owners of the coal land in this section, the Flat Top Land Trust and the Crozer Land Co. Of this large area from 160,000 to 175,000 acres are underlaid with coal. The No. 4 vein, the one worked, has an average thickness of about 8 feet. At the usual estimate of 1,000 tons per acre for each foot of coal, from these figures some idea of the vast amount of coal in this field may be gained.

EXHAUSTION OF FIELD.

On the basis of 7,500 tons of coal to an acre, a shipment of 7,500 tons of coal a day, which is 50 per cent. in excess of the present daily shipments, would exhaust but an acre a day, or allowing 300 working days in a year, 300 acres annually. This would give a yearly output of 2,250,000 tons, which is half a million tons in excess of the production of 1888, including that used as coal and coke. At this rate of production the leases already given would supply the demand for 30 years. On the basis of from 6,000 to 8,000 tons to an acre, say an average of 7,000 tons an acre over the whole field, the coal fields now controlled by the two parties named, carry in vein No. 3 alone on a coal area of 160,000 acres, 1,120,000,000 tons, and the other veins that will be available when No. 3 is exhausted, fully as much more.

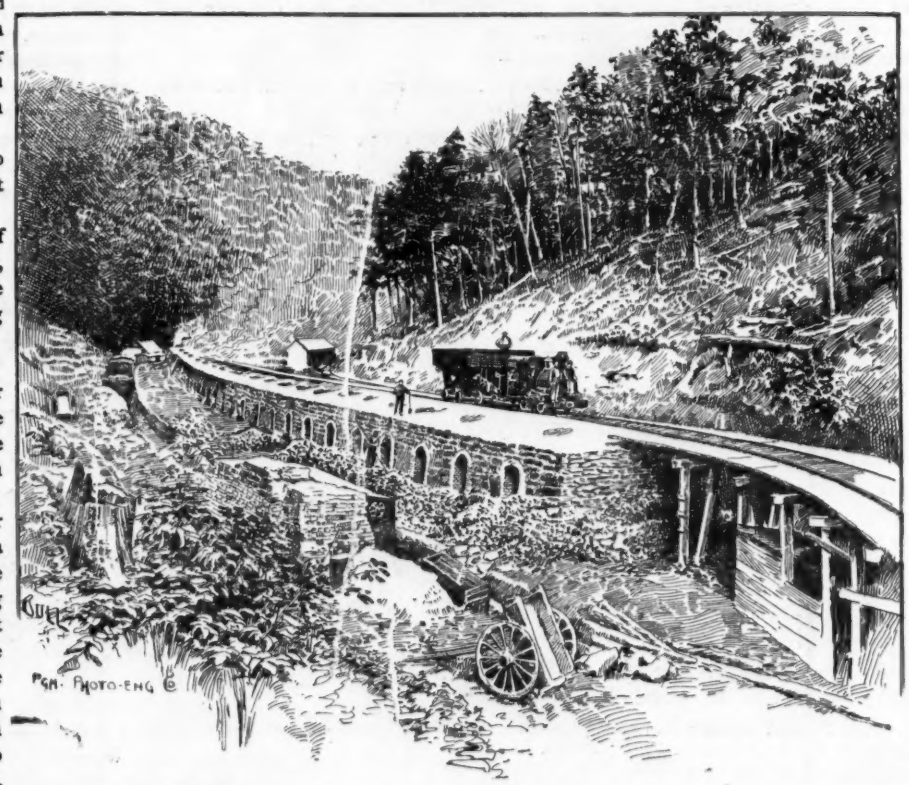
EASE OF MINING.

Not only have the operators this magnificent seam of coal to work upon, with its good roof and floor, but the mines are situated above water level, requiring no drainage. Indeed, some of the mines of the Southwest Virginia Improvement Co. are so dry as to require constant wetting to guard against a recurrence of the disastrous explosion for which this mine has become unfortunately noted. The measures seem to be nearly horizontal, the rise of the coal bed being no more than is needful for drainage. This also reduces the cost of hauling to a minimum. Where mules are employed, the absence of heavy grades permits large loads, and the vein is so high that mine locomotives can be employed when desired without many of the objections to their use that are found in other sections. There is an ample supply of timber to furnish all that is required in mining operations. The lessees are permitted to cut from the premises all timber necessary for building purposes or mine use. The most of the companies set up saw mills and get out all lumber required for their buildings, etc., thereby saving a large bill of expense.

Relative to ease of mining it may be noted that 3,547 tons of coal were brought out to one tipple at one of the Southwest Virginia Improvement Co.'s mines, recently, in one day. This was all gathered from the workings two miles away, and brought forward by mine locomotives. A gondola car, holding 20 tons, is loaded at this tipple, every minute and a-half.

CHARACTER OF THE COAL.

The Flat-Top coal is a semi-bituminous coal, somewhat dull in lustre, rather hard in the vein, requiring powder to mine it, but, as will be seen from



the following analyses, low in volatile matter and ash and high in fixed carbon. It is a superior grate and steam coal, giving an exceedingly bright, hot, clear fire. It makes an excellent coke.

As to the value of this coal as a steam and grate fuel a word may be said. It burns with a short, fierce, bright flame, comparatively free from smoke, and generates an even temperature of high calorific power and intensity. It generates steam quickly and in large quantities. Of the analyses of the Flat-

Top coal given below No. 1 is an average of five samples from the mines of the Southwest Virginia Improvement Co. in the Pocahontas field; No. 2 is "run of mine" from same district; No. 3 is from Mill creek in the Bluestone district, and No. 4 from Flipping Creek in the same district; while No. 5 is an average of 15 analyses of the coal from the two districts; No. 6 is from the Elkhorn:

ANALYSES OF POCAHONTAS FLAT-TOP COAL.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.
Water	.932	.684	.492	.786	1.011	1.112
Volatile matter	20.938	19 964	19.278	18.939	18.812	17.898
Fixed carbon	73 728	73 021	73.948	76.077	72.708	74.524
Sulphur	.668	.656	.847	.793	.787	.514
Ash	3.984	5.675	5.435	3.405	5.191	5 952

Taking No. 5 of the above, which is an average of 15 analyses, as the average analysis of the Flat-Top coal, and the analysis of the coal of the Broad Ford mines of the H. C. Frick Coke Co., as the typical analyses of Connellsville coal, and we have the following for comparison:

	Flat-Top coal.	Connellsville. coal.
Water	1.011	1.260
Vo'atile matter	18 818	39 107
Fixed carbon	72 708	59.616
Sulphur	.787	.784
Ash	5.191	8.233

The important differences in these coals are in the percentages of volatile matter, fixed carbon, and ash. The effect of these differences will be discussed in connection with the discussion of the coking of these coals.

PRODUCTION AND PRICES.

The first shipments of coal from this field were made in 1883, from Pocahontas. Including the shipments in that year, up to January 1st, 1889 there have been sent to market from this field via the Norfolk & Western railroad, 4,378,000 tons of 2,000 pounds each. The production, not including that used for coke, has been a little in excess of this. The following shows the production and shipments of coal from the Pocahontas Flat-Top coal fields from 1883 to 1890, inclusive, in tons of 2,000 pounds:

Year.	Production.	Shipments.
1883	68,127	58,992
1884	196,283	193,257
1885	581,681	573,954
1886	857,960	849,974
1887	1,149,278	1,148,986
1888	1,541,131	1,524,742
1889	1,783 583	1,785,292
1890	2,044 567	2,044,635

The shipments at the present time are far behind the orders, owing to scarcity of transportation facilities. Additional cars are being built which will obviate the reduction of production from this cause.

Shipments of coal from Pocahontas Flat-Top coal fields are divided as to size of coal, from 1887 to 1890, inclusive, as follows:

	1887. Net tons.	1888. Net tons.	1889. Net tons.	1890. Net tons.
Run of Mine	1,083,032	1,458,499	1,638,090	1,966,099
Lump	60,789	65,355	70,893	56,557
Nut	.....	.....	4,363	15,287
Slack	5,105	16,2.7	10,237	6,624
Total	1,148,986	1,541,131	1,783 583	2,044,567

"Run of mine" must contain at least 40 per cent. of lump, and is sold to the Pocahontas Coal Co. for 85 cents per ton f. o. b. at the mines. To produce "run of mine," especially at those works making coke, the coal is run over a screen with one inch meshes. When lump is desired the bars are three inches apart. Lump is sold at $1 per ton and slack at 85 cents per ton.

Under the terms of the leases all coal, except that used for coke, must be sold to the Pocahontas Coal Co., who make all sales and assume all liabilities for the same. This company pays the coal operators by check on the 15th of the month for all coal shipped during the preceding month. The risk of bad debts, shortage in shipments, freight rates, etc., no small items, are thus avoided by the operator, who is sure of a check in payment for all the coal he has mined. The coke is sold through another agency.

The Pocahontas Coal Co. exercise the greatest care in securing for market a clean coal. They employ a general inspector for the entire field. This inspector places a sub-inspector at every tipple in the region, whose duty it is to stand on the car and watch every pound of coal dumped, and see that not the least bit of slate or bone coal or rusty coal is loaded. While the coal from this region is generally clean, this precaution, no doubt, sends the Flat-Top coal into market freer from dirt and impurities than any other steam coal in the country.

WAGES AND COST OF COAL.

The rates paid for mining in this district are 75 cents per wagon of 90 cubic feet (2 tons) for room coal, and $1.05 a car for entry coal. As more than the usual proportion of the coal taken out is entry coal, this increases the cost at the present time somewhat above the average, but in the near future when the rooms are mined out the cost will be reduced below the average. On the basis of 45 cubic feet to the ton of 2 240 pounds, the price of mining is 37½ cents for the room coal and 52½ cents for entry coal. Breaking through rooms is paid $1 00 per yard and tonnage; turning rooms 50 cents per yard and tonnage. The company lay all roads and post the rooms, the miner having nothing to do but mine and load into the car everything he brings down from the vein. Drivers are paid $1.68; trappers, 58 cents; track layers, $1 75; men at the head of the tipple, $1.75; men standing props, $2 00; laborers, $1.20 per day. Powder costs the men about 5 cents a ton of coal mined; tool sharpening, 50 cents a month. Good miners average 4 cars a day in the Pocahontas mines. On the narrower seam on the Bluestone a miner with a boy or a common laborer will average about the same. It is estimated that the average wages of miners per month are $45, some make as high as $120 to $130 per month.

Prop setting and track laying costs the operators at some places, it is claimed, 5 to 6 cents a ton of coal produced. It is asserted, however, that in some cases it can be done from 2½ to 3 cents, and even as low as 1¼ cents. When so large a proportion of entry work is done as in this field the cost of timbering is above the average.

From the above figures some idea as to the cost of coal per ton may be gathered. It is claimed that the cost of dead work and hauling is 25 cents a ton. On the basis of room coal, then, the cost would be as follows:

	Cents.
Mining	37½
Dead work and hauling	25
Royalty	10
Total	72½

This is probably very near the cost of "run of mine" coal. If the mine cars hold over two tons the cost of mining will be relatively reduced. In estimating profits it should be borne in mind that pay is largely in store orders, which may be regarded as either reducing the cost or increasing the profit.

THE COAL AS A COKING COAL.

An inspection of the analysis of the Flat-Top coal would not lead to the belief that it was a good coking coal. While it has the advantage of being low in ash, and consequently should produce a coke high in carbon, it would be regarded as being too low in volatile matter to agglutinate properly having, as per the typical analysis given elsewhere, only 18 812 per cent, as compared with 30 107 per cent. in the Connellsville coal. While it makes an excellent coke when burned as run of mine the coke is greatly improved by having the coal specially prepared for coking by crushing. When "run of mine" is charged, the lumps frequently come out of the oven simply charred, the volatile matter being driven off and the bond of the coal entirely broken. This charred coal is known locally as "roasted coal." Notwithstanding this lack of volatile matter the coal makes a most excellent coke, not as bright as the Connellsville, possibly more friable, but having more fixed carbon, making a first-class furnace fuel, capable of carrying in the furnace as heavy a burden as the Connellsville and being much lower in ash.

The coking process is carried on, however, at the expense of a considerable portion of fixed carbon. To make a ton of coke requires 1.6 tons of coal containing, on the basis of 72 708 per cent. of fixed carbon, 126⅛ units of carbon. In other words, as the coke contains only 91½ units of fixed carbon there has been a loss of 34 5 6 units of carbon in the coking process, or more than one-fourth of the fixed carbon contained in the coal necessary to make a ton of coke. In coking Connellsville coal, little or no fixed carbon is lost, or if it is burned its loss is made up by the carbon from the volatile matter, so that in the coke there will be found more carbon than the total fixed carbon in the coal. The practice with this Flat-Top coal should certainly be better than it is at present, and the percentage of coke obtained greater. Better results no doubt will be secured through improvements in preparing the coal for coking, through other improvements in the ovens and in coking methods.

OVENS.

The ovens used in this district are, without exception, bee-hive. Some experiments, as is stated elsewhere, have been made in coking the coal of this district in the Soldenhoff-Coppee oven, but, though admirable results were obtained, the oven has not been introduced into this district. The earlier ovens built were 11′ 6″, but all those recently constructed are 12′. All the ovens on the Elkhorn are the larger size. Most of the ovens in the region have been constructed by Mr. John H. Wilhelm. The illustrations of ovens given are from drawings furnished by him.

The cost of a bank or block of ovens in this district varies somewhat with the nature of the ground and consequent amount of grading to be done. Mr. Wilhelm estimates the cost per oven of a block or bank of 100 ovens as follows:

Double block, including rail on top of ovens and larry, each.....$375
Double block with rail only, each..... 350
Single bank, $25 each, less.

Mr. Wilhelm also estimates the cost of block ovens, including grading, wharf, larries, tipple cars, etc., at $450 each. The actual cost of a block of 100 ovens built in 1888, not including mine cars, was $43,600. This block required some heavy grading. The bricks used are chiefly Mt. Savage and Black Lick, and were delivered in 1888 as low as $27 per 1,000.

Mr. Wilhelm is of the opinion that the ovens are too large for the coal used. His view is that the 11′ 6″ oven burns more actively and quicker than the 12′ oven. The charge for the 12′ oven he regards as so heavy and deep that either the charge must be coked at the expense of the coal at the top, or the bottom of the charge will be improperly burned, giving black ends. It is possible that in changes in shape and size of oven will be found a method of reducing the waste of fixed carbon in the process of coking referred to elsewhere.

CONSTRUCTION OF THE OVENS.

Though the bee-hive ovens in this district do not differ materially from those of other districts, we show in the accompanying cuts their construction and arrangement as a matter of interest to those not posted on the details of these ovens.

The ovens are of the ordinary bee-hive type and in two rows; each oven has a space of 6 inches between it and the adjacent one transversely, and 3 inches space between it and the adjacent one longitudinally.

The ovens are 12 feet in diameter, 6 feet 6 inches high in the center, 1 brick thick, and have necks turning out, as shown by Figs. 2 and 3, so as to remove the door as far as possible from the excessive heat of the charge. The block if faced with rough rubble masonry. Piers are built up between the ovens, as shown on Figs. 2 and 3, and are 8 feet wide at the top, 7 feet wide at the bottom and 18 inches thick; three rails are placed upon the piers for running the coal larries upon. The material is dumped from the larries through the funnel heads into the center of the ovens, as shown on Figs. 2 and 3. The coke is discharged by hand through the doorways, which are 3 feet high in the center by 2 feet, 8 inches wide, and bricked up during the coking of the coal. A hose is provided, as shown to the right of Fig. 1, for watering the coke. A platform is erected on either side of the ovens, which is about 5 feet above the railway sidings.

NUMBER OF OVENS.

The first coke ovens erected in this field were those built by the Southwest Virginia Improvement Co., at Pocahontas, in 1883. The first ovens built in the Bluestone region were in 1886, while the first ovens built in the Elkhorn dis-

trict were built in 1888. At the close of 1888 there were in this field 1,282 ovens, about equally divided between the three districts, there being 400 in the Pocahontas, 486 in the Bluestone and 396 in the Elkhorn district.

The number of ovens built and building, at the close of 1890, and the number contemplated in the near future, are shown in the following table. The ovens put down as "completed" represent all the ovens that can be in operation until next May or June, as all construction work has ceased for the Winter. The ovens reported in the column "under construction," are partially built and will be completed rapidly when Spring opens; while all of those given as "contemplated," will doubtless be built next year:

POCAHONTAS DISTRICT.

	Completed.	Under construction.	Contemplated.
Southwest Virginia Improvement Co.	400	250	.....
BLUESTONE DISTRICT.			
John Cooper & Co.	150	.....	.....
Caswell Creek Coal & Coke Co.	140	.....	70
Booth-Bowen " " "	91	.....	.....
Buckeye " " "	100	.....	.....
Goodwill " " "	50	.....	.....
Louisville " " "	50	25	.....
ELKHORN DISTRICT.			
Elkhorn Coal & Coke Co.	100	.....	.....
Shamokin " " "	100	.....	.....
Norfolk " " "	100	72	.....
Turkey Gap " " "	100	15	50
Crozer " " "	216	16	100
Houston " " "	100	.....	.....
Coaldale " " "	17	36	.....
Powhatan " " "	100	.....	.....
Lick Branch Colliery	70	50	.....
Lynchburgh Coal & Coke Co.	.....	100	.....
Keystone " " "	.....	.....	100
Gilliam " " "	.....	.....	100
Algoma " " "	.....	.....	100
Totals	1,884	564	520

It will thus be seen when all of the ovens that are under construction and contemplated, are built, the total number of ovens in the field will be 2,968. This will make this coking district one of the most important, in number of ovens, of any in the country. It will be surpassed in this respect only by the Connellsville, Pennsylvania and the Alabama districts. The indications are also that the growth of this district in the near future will place it both in its number of ovens and its production, far in advance of that of any other coking district in the United States, except the Connellsville.

The growth in the number of ovens in this district since 1883 is shown in the accompanying table:

	Pocahontas District.	Bluestone District.	Elkhorn District.	Total.
1883	200	.....	.....	200
1884	200	.....	.....	200
1885	200	.....	.....	200
1886	200	10	.....	210
1887	300	384	.....	684
1888	400	486	396	1,282
1889	400	572	778	1,750
1890	400	581	903	1,884

COKING.

The charge to a 12′ oven is about 9,000 pounds for 72-hour coke, and 8,000 for 48-hour. In burning, the oven is exceedingly hot, "a white heat." Though the oven is so hot in burning, there is still difficulty experienced in maintaining hot ovens, except at the expense of the fixed carbon in the coal. Great care is also required in quenching the ovens properly in drawing in order to avoid "cold bottoms" and "black ends." When these do result, the greatest care is necessary to bring the ovens up to the proper heat again.

As suggested elsewhere, this waste of fixed carbon in the process of coking indicates that the process as carried on is not the best, in view of the character of the coal, and that there is room for improvement. It is a well-known fact that within certain limits the higher the temperature in the oven during coking, other things being equal, the greater the yield of the coal in coke. As the heat in coking this coal is so high, the yield should certainly be greater than it is. The coke made, however, is most excellent fuel; and while it may not be possible to conduct the process of coking with the loss of volatile matter only, there should be a large reduction in the amount of fixed carbon consumed.

Not only this, but there should be a great improvement in the looks of the coke. It is not as handsome as the Connellsville. It lacks that bright lustre which characterizes the Pennsylvania coke. The coke on the wharves at the time the ovens were visited contained a large proportion of "black ends," but this was explained by the fact that the demand for coke was sufficient to keep the ovens in operation but about half-time, and the bottoms of the ovens were not kept hot enough.

There is no doubt but that a marked improvement in the coke can be secured by reducing the coal, previous to coking, to a uniform degree of fineness. By this course, not only will the production of "roasted coal" be avoided, but the exposure to the heat of a large surface of fine coal will cause it to evolve its volatile matter more quickly, and to coke more rapidly than when lumps of coal are present in the charge. Crushing is done at some of the coke works. The coke made from this crushed coal seems to be more regular and compact than that from uncrushed coal. So great benefit has resulted from crushing that most of the works are adding crushers to their plant.

Another difficulty experienced in this region at some works is the want of water at times. This is being remedied by sinking wells.

Some very good results have been obtained with this coal in the Soldenhoff-Coppee oven. Some 175 650 pounds of coal from the Bluestone district was sent to the Coppee ovens in the New River district. Of this amount 46,850 pounds were "run of mine," the rest was slack. Five different tests were made, the charges being from two and a half to three tons to an oven, the number of ovens charged from four to nine, and the time of coking 24 to 48 hours. The average yield in the five experiments was 67½ per cent.; the coke burned 36 to 48 hours was the best; it was bright, regular, compact and uniform throughout. A statement of the chemical and physical tests of the coke so made is given elsewhere.

We append two additional table (brought up to the close of 1890) showing the production by years and distribution thereof:

A statement showing the production of coke in the Pocahontas Flat-Top district, by years, from 1883 to 1890, inclusive:

	Per tons of 2,000 lb.
1883	22,718
1884	57,107
1885	50,194
1886	60,435
1887	150.708
1888	201.317
1889	310,504
1890	433,527

The following is a statement, showing number of cars of coke shipped from the Pocahontas Flat-Top district, and distribution thereof, for the year 1890, as compared with previous years:

Destinations (by groups.)	1890. Cars.	1889. Cars.	1888. Cars.	1887. Cars.
To points on Norfolk & Western R. R.	9,092	9,001	6,715	4,324
" " " Shenandoah Valley R. R	2,426	494	379	1,650
" " " other railways of Virginia	19	13	14	13
" " north of Harperstown and Shenandoah Junct.	13	196	.....	.....
" " south of Bristol	9,143	6,127	2,717	1,275
" " in North and South Carolina	133	12	11	13
" Chicago, Ill	.....	.....	71	525
" East St. Louis, Ill	58	65	527	653
" East Carondelet, Ill	.....	54	660	.....
" Louisville Ky	1	21	.....	65
" Joliet, Ill	.....	.....	.....	84
" Terre Haute, Ind	.....	.....	.....	3
" Centralia, Ill	.....	.....	1	.....
Totals	20,885	15,983	11,095	8,603
Representing a total tonnage of	Tons. 433,527	Tons. 310,504	Tons. 202,808	Tons. 151,171

PHOSPHORUS IN IRON AND STEEL.

BY JACOB REESE.

It is generally known that phosphorus is very objectionable in iron and steel, as it makes the iron cold short and the steel brittle. Now, in the manufacture of iron by the puddling process, the phosphorus is eliminated by *liquation* to a large degree, so that iron may be puddled even though it contain from ½ to 2 per cent. of phosphorus. But when Mr. Henry Bessemer invented his process for making steel, he found that he could not eliminate the phosphorus because he made the steel in a liquid state, and a liquid cannot be liquated under such conditions, therefore he required iron ores for his process that would not leave more than one-tenth of one per cent. of phosphorus in the resulting steel, and this demand made the Bessemer iron ores of a high-priced class.

A few days since a gentleman came into my office, and said that he had a mountain of the best and purest iron ore in Texas, ever known, and showed me a statement that charcoal pig metal could be made at that point from this ore at a cost of $10 per ton. He said that the analysis showed that it was very low in phosphorus. I replied that I was sorry to hear that the phosphorus was so low, for the iron in his ton of pig metal was only worth three-quarters of a cent a pound, while the phosphorus that was in it was worth 10 cents per pound, more than 13 times as much as the iron. And, although he was pretty well posted in general, he was astonished to hear that we are now in a quiet way making about 1,000 tons of steel per week, this steel contains 67 lbs. of phosphorus in each ton, which is 67,000 lbs. I then oxidize this phosphorus to P_2O_5 by adding the following amount of oxygen, 86,128 lbs.; thus producing phosphoric acid, 153,128 lbs. We then add fresh lime, 612,512 lbs.; which give us phosphate of lime, 765 640 lbs. We then grind this phosphate and bag it and sell it as odorless phosphate, the price is one cent per pound by the bag, $18 per ton in less than car loads, and $15 per ton in 100 ton lots. The sales will average about $16 per ton at the works. Now, 765 640 lbs. at $16, gives us $6,124.12 per week for the phosphate that we make in extracting the phosphorus out of 1,000 tons of metal.

This phosphate is a new chemical compound, never known until I produced it by the practice of the basic process. It proves to be the quickest and finest plant food ever used, and is now in great demand for fertilizing the orange groves of Florida. It makes the oranges to ripen quicker, and makes them heavier with luscious juices than ever known before. It is also in demand by the grape growers, for they have found that the stinking phosphates, when used on grape vines, give the grapes a flavor not their own, and as the odorless phosphate which I produce from the steel is as odorless as wood ashes and as healthy as a sunbeam, they use it on grape vines so as to secure a more delicate flavor in the grape. It is also now being used largely by the truck gardeners as a fertilizer for vegetables for table use. And people are now beginning to inquire, "are we not carrying bacteria to our tables, and thus swallowing disease germs with our food, when we eat vegetables fertilized with decaying matter?"

I gave my Texas expert this and more than this, and he has gone back to Texas to hunt for a phosphoritic iron mine, so that, in dull times like these, he can make a handsome profit by giving the steel at cost, and selling the phosphate for a compensation, together with the satisfaction that he is making the richest, the cheapest and the finest plant food ever known, and warranted free from the deadly bacteria that is so often carried from the slaughter-house to the farm, and then to the graveyard.

PHILADELPHIA, April 14, 1891.

Testing Steel Tires.

The Pennsylvania Railroad is engaged in experiments to determine the relative wearing qualities of hard and soft locomotive tires. Dr. Dudley, the chemist of the company, who has charge of the tests, selected steel containing 7 per cent. of carbon for the hard tires and 3 per cent. for the soft ones. Before being put on the wheels of the locomotives each tire was carefully marked and measured, and a hard tire and a soft tire was put on each axle, so that a perfectly even distribution of the two kinds of steel was secured. The engines have been in use for several months, and a record is kept of the wear

F. E. MYERS & BROS.—SPRAYING.

Among the many articles that have been written, in all the class journals, none has obtained more attention than the subject of spraying, so that it is hardly necessary to say anything to show the necessity for a device that will serve so useful a purpose. Yet it is a fact that spraying not only pays, but that it is as well a necessity to insure better and larger crops.

Prof. S. A. Forbes, State Entomologist of Illinois, in his record of experiments against the apple and coddling moth, says: "That the result of once or twice spraying with Paris green in early Spring, before the young apples had formed upon their stems, resulted in saving about 75 per cent. of the apples exposed to injury by the coddling moth.

Experiments at the Ohio Agricultural Experiment Station, carried on through two seasons upon two varieties of cherry trees and four varieties of plum trees, demonstrate that by the use of two or three applications of arsenites in water in the proportion of one ounce to ten gallons of water, about three-fourths of the trees liable to be injured by the plum curcolio can be saved; that a large proportion of the plum crop can be saved by the same treatment when a fair amount of fruit is set; that if an interval of a month or more occurs between the last application and the ripening, no danger may be apprehended from its use; that spraying with arsenites is cheaper and more practical than any other known method of preventing the injuries of this insect.

At the Montgomery County (O.) Horticultural Society, recently, some important results were given on the subject of spraying. Mr. Geo. W. High, of the Middle Bass Island, one of the most successful grape growers on the island, recommends spraying of vines to prevent mildew or rot, applying it a week or ten days before blossoming, then just after blossoming, or when the

fruit is set, and two or three more times between then and the ripening of the grapes. The mixture consists of one pound sulphate of copper, dissolved in three gallons of hot water, and when cold add one pint spirits of ammonia, then 22 to 25 gallons of water. It is inexpensive, quickly done, and very efficacious. Prof. Weed, of the Ohio Experiment Station, recommended the use of spraying fruit and other trees.

With the foregoing information on the subject we submit a description of the Myers' spray pump, which is constructed on the most approved plan, and in harmony with the requirements that have been developed by men prominent in experimental stations. It is double-acting, with expansion rubber bucket, has a large air-chamber to cushion the spray, is provided with two discharged ports, both of which can be used for spraying or one as an agitator. The base is properly shaped to fasten on the staves or head of a barrel, has steel pins, brass plunger cylinder, good leverage, is very powerful and easy to operate, will throw a spray as fine as mist over any ordinary fruit tree, and will throw a solid stream 60 feet from the point of the nozzle. With the proper hose or pipe extension attachments, these pumps are adapted for use in connection with vines, shrubs and fruit trees of various kinds for the extermination of any kind of insects that are injurious either to the fruit or trees, vines or their foliage.

F. E. Meyers & Bros., of Ashland, O., not only make a spray pump, but manufacture as well, a large assortment of hay tools. This is one of the largest establishments of its kind in the country, having in 12 different cities branch houses, which give them a very wide name, North, South, East and West.

Personal Supervision of Business.

The dealer who fails to give his business personal supervision makes a mistake that he too often realizes only when it is too late. No matter how reliable and efficient his employes may be there is an urgent, never-ceasing demand for the presence of the proprietor in his store during business hours. It is not only to his advantage to be on hand and know what is going on, but customers are better satisfied to find him there in case a question should arise that the clerk would find it very difficult, if not wholly impossible, to pass upon. The dealer's personality becomes so closely identified with his business that it is not the same in his prolonged absence as when he is in the store at regular periods during each business day in the year. Recreation is well enough in its way, but the sort of recreation that absorbs the greater portion of a merchant's time is not compatible with business success. Take two dealers in the same line, carrying equally good and complete stocks, and let one be found at the store regularly and the other semi-occasionally, often absent for several days at a time—and the one who is regular will certainly eventually absorb the cream of the trade. It is an unwritten law that "recreation" and "rest" must come after the merchant retires from business, and not too often during the battle for a competency. The general who says "come" to his troops accomplishes more than the one who says "go."—[Stoves and Hardware Reporter.

THE GROWTH OF TRADE PAPERS.

There are at least 200 trade journals published in this city. In the last 20 years their increase has been enormous. There is not only not an industry nor a business left unrepresented, but for many of them half-a-dozen separate journals are found necessary.

The importance of the trade journal, however, is not seen only in this increase in number, but in their growth, development, the ability with which they are conducted, and the luxuries of type, paper and illustration in which they indulge. In these respects they rival the magazines, and the magazines require the services of some of the most artistic presses of the town.

In their relation to that vast commercial structure on which the prosperity of the city rests, trade journals serve as vital points of intersection and connection between the different parts. It is interesting to observe the threads of continuity that ramify and bring into touch the diverse and farthest outlying commercial interests—chemical dyes and Alaska fisheries, bonnets and Bessemer steel, through fancy goods, hardware and ostrich farms. To glance at their summaries is to keep abreast with progress, movements and tendencies of the age. They are not confined to commerce, but include the entire body politic.

A real estate paper does not concern alone the man who wishes to sell and him who wants to buy; it interests the lawyer who will make the transfers, the banker who will furnish the money, the architect who will plan the house the builder, the plumber, the decorator, the electrician, and the insurance agent, who will be called upon to take its risk against fire. To interest further, all these readers the publication takes on a large scope. Land, finance, woods, stones, new household inventions, exterior decorations, the grading of streets, assessments, taxes, municipal affairs, politics, each properly has its place.

This new view of trade journalism marks an era in its development and its prosperity. In its beginning it was merely an endeavor of the manufacturer, the wholesale man to find his consumer in a more direct manner than he could find in the maze of advertisements of a daily paper, and it took the simplest form of putting his wares under the consumer's eye in the form of a prominent advertisement with a thread of reading matter concerning the particular matter in which they were interested. That is the manufacturer's idea to day, but its manifestation has far outgrown the idea of a score of years ago. The *Iron Age*, for example, in its earlier files, was a three-sheet paper. It now not infrequently numbers 70 pages. The *Record and Guide* was a slender folio. It is now almost a volume, sometimes numbering 110 pages. The same increase in size and scope can be paralleled in other of the first-class and long-established trade journals.

This enlarged demand has inevitably required a much larger investment of money, with the result that most of the trade journals are in the hands of incorporated companies. These devote themselves to publications touching the different sides of large interests. In matters relating to insurance, for example, there is the Spectator Co., which issues 20 different publications.

The editors of trade journals, with the modesty peculiar to the conductors of those papers, aver that the standard of ethics is higher and that the standard of editorial ability is higher in their publications than in the daily papers. They argue that the daily journals, by virtue of their necessity, treat of myriad subjects and events concerning different parts of the world of which it is impossible that they should know with full understanding. On the other hand, the trade journal addresses itself to those fully acquainted with the subject of which it treats; consequently those who write for it must be persons who can speak authoritatively as well as knowingly. This brings to their service only those of acknowledged ability. While subjects outside of their special lines are touched upon, they feel that the trade paper has weight that the daily paper cannot claim.

The new illustrative processes have been called in for the adornment of the trade journals. The cuts which are lavished through the advertising departments require paper of special fineness. This in the editorial and reading matter is freely adorned with head-pieces, tail-pieces, initial letters, reproduction of pictures, and pictorial stories after the manner of the comic papers.

That all trade journals are not equally reputable, and that some are born of bad motives, is doubtless true; but the proportion is small, and carry the seeds of their own destruction. For the most part there are very few trade journals that even by an outsider may not be read with entertainment as well as with profit.—[New York Evening Post.

Wastefulness of Steam Hammers.

To obviate the notorious wastefulness of steam hammers an improvement has been introduced at the Chemnitz Works, in fitting the hammers with two pistons of different diameters, compounding them, in fact. The tup is raised by steam at boiler pressure acting on the under surface of the smaller piston; and this steam, on expanding, adds to the force of the blow by acting on the upper surfaee of the larger piston.

INDUSTRIAL SUMMARY.

New Enterprises:—

Harris Brothers, of St. Paul, Minn., are at the head of an enterprise that proposes to build a large rolling mill at Minneapolis.

A wire fence factory will probably be established at Knoxville, Tenn. The Secretary of the Chamber of Commerce may be addressed for information.

The Bogenschutz Stove & Range Co. has been incorporated, at Covington, Ky., to manufacture stoves, hollow ware and castings. The capital is said to be $100,000.

A charter has been issued to the Eureka Nut Lock Co., of Pittsburgh, Pa., with a capital of $30,000, and as directors Wm. H. Hays and John W. Parks, Pittsburgh, and David E. Park, Allegheny City.

The National Cash Register Co., of Dayton, O., purposes establishing a plant for the manufacture of cash registers in Canada, its object being to secure the full benefits of its patented rights in Canada.

The Brayton Motor Co., Chicago, has been formed to manufacture and sell the Brayton hydro-carbon engine, with a capital stock of $500,000; incorporators, C. Robinson Holmes, G. L. Dickinson and Eugene White.

Articles of incorporation have been filed by the Northwestern Engineering & Machinery Co., of St. Paul, Minn. The capital stock is $50,000, and the incorporators are Charles A. Daigh, W. G. Strickland and J. M. Badger.

The American Mining & Milling Machine Co., Chicago, is a new concern to manufacture mining, milling and other kinds of machinery, with a capital stock of $1,000,000. The incorporators are William Armstrong, Frank B. Dyche and Lawrence Harmon.

The Lewis Steel Sheet & Tinplate Co., of Chicago, Ill., has been incorporated to manufacture steel sheets, block sheets and other steel and iron products; the capital stock is $500,000. The incorporators are J. Davis, Lewis D. Trevor, Lewis and Nathaniel D. Lewis.

The Bowne Pneumatic Signal Co. was recently organized, at Baltimore, Md., with R. T. Bowne, of Harford County, President; J. C. Gittings, Vice-President, and A. R. White, Secretary, to introduce the patent pneumatic railroad crossing signal of R. T. Bowne. C. L. Howell is General Manager of the company.

The John F. Byers Machine Co., of Ravenna, O., recently organized with E. R. Crowell, President; Marvin Collins, Secretary and Treasurer; and J. F. Byers, Superintendent, has just finished the construction of its brick machine shop 28x120 feet. It is the company's intention to add a large foundry building the coming Summer.

The Oil Well Supply Co. has filed application for a charter in Pittsburgh, Pa. The stockholders are John Eaton, of Pittsburgh; E. H. Cole, Brooklyn, N. Y.; E. G. Burnham, Bridgeport, Conn.; Ezra T. Homes, Olean, N. Y.; Kenton Chickering, Oil City, Pa., and Kenton Saulnier, Bradford, Pa. The object of the company is the manufacture of iron and steel products.

A company is being organized in Youngstown, O., for the purpose of building a $75,000 plant in that city, for the manufacture of the Bostwick metal lath. The company will be composed of the Bostwick Metal Lath Co., of New York, and Youngstown and Niles citizens. Although the organization is not quite completed, and the site not yet chosen, some of the machinery for the proposed plant has already been purchased.

The Standard Boiler & Bridge Works, of Bellaire, O., has been chartered for the purpose of doing a general boiler and bridge manufacturing business. The company has elected the following officers: President, Edward Jones; Vice-President, O. T. Blackburn; Secretary, Samuel Simmons; General Superintendent of the mechanical department, J. E. Jarold. The material for the company's iron buildings has been ordered, and Mr. Jarold has started on a trip to buy the machinery. The new concern will be located near the Bellaire Nail Works.

The Grand Trunk Railway Co. is preparing to build a rolling mill and forge works, at Point St. Charles, near Montreal, at a cost of about $50,000, the intention being to have the establishment in operation by the ensuing Fall. It is proposed to manufacture all the bar iron necessary for the various purposes in the construction of cars, and also car axles. In this way the company will utililize its scrap iron. The buildings will be 200 feet long by 75 feet wide, and the works will be equipped with a 12-inch mill and several power hammers.—[Canadian Manufacturer.

Additions, Enlargements, Removals, etc.:—

C. F. Kane, of Martin's Ferry, O., has established a branch machine shop in Mannington, W. Va.

It is stated that the Magnetic Machine Manufacturing Co., of Grand Rapids, Mich., will remove its motor works to Basic City, Va.

It is stated that the Lattimore Machine Co., St. Louis, Mo., will build a new factory on East Elwood St., on land donated by the city.

The Bessemer (Ala.) Machine & Foundry Co. has commenced the manufacture of agricultural implements, and will enlarge its plant and put in additional machinery.

The Riverside Iron Works, of Wheeling, W. Va., is having an addition or wing, constructed of corrugated iron, built on the east side of their tube works, at Benwood, with dimensions of 240x100 feet.

At Colorado Springs, Colo., the Rapid Transit Co. are about to add to their plant, and will build in connection therewith, a machine shop, and equip the same with new and improved tools, among which are lathes, drill, wheel, press, etc.

The Albion Iron Works Co., of Victoria, B. C., will erect and equip suitable shops at Esquimault, B. C., in the immediate vicinity of the dry dock there—the better to enable them to carry on that branch of their business calling for repairs to vessels in the dock.

The Webster, Camp & Lane Machine Co., of Akron, O., has added $15,000 worth of new tools to its machine-shop equipment, and at present contemplates increasing the size of its plant by erecting two or more brick buildings of large dimensions. It is at present employing some 225 men in the manufacture of mining machinery and steam engines.

A correspondent at Trinidad, Colo., informs us that the negotiations concerning the Trinidad Rolling Mill have been closed, and that the plant has been leased to R. J. Wick, of Youngstown, O., for one year, with the privilege of purchasing it at the end of the year for $26,900. It is understood that Mr. Wick, who is now at Trinidad, will improve the plant to the extent of $6,000 or $8,000, and that the mill will be in operation in a short time. The mill was built in 1888-9, and is said to have originally cost $65,000.—[Bulletin.

Fires and Accidents:—

Fire has destroyed the foundry department of the Poorman Iron Works, Canton, O., where some valuable patterns were stored. The loss is several thousand dollars.

The stove foundry of W. L. Sharp & Son, Steubenville, O., took fire, April 9, and was damaged to the extent of $20,000. The four-story building was totally destroyed, together with the entire contents. The building and machinery were insured for $14,500.

General Industrial Notes:—

William Tod & Co., of Youngstown, O., are building the hydraulic screw mechanism for the blooming mill of the Cleveland Rolling Mill Co., from special designs by Henry Aiken, of Pittsburgh.

The Ætna Iron & Steel Co., of Bridgeport, O., are making considerable enlargements to their rolling mill. William Tod & Co., of Youngstown, O., will furnish a 36x48 Porter-Hamilton engine and other special work.

The catalogue of the Charter Gas Engine Co., of Sterling, Ill., is at hand. In it is printed a number of letters which have been received from some of the customers of this enterprising company. The tone of all the letters is evidence enough, to a purchaser, of the superiority of their engines.

We are in receipt of the catalogue of the Jeffrey Manufacturing Co., of Columbus, O., manufacturers of coal mining machines, elevating and conveying machinery. It is printed on super-calendered paper with a handsome cover. The catalogue is full of cuts and descriptive matter of the various kinds of machinery they manufacture. They are making a specialty of electric coal mining machinery, and have a reputation on this class of work second to none in the country.

The Sykes Iron & Steel Roofing Co., of Niles, O., secured and have completed their contract with Cartwright, McCurdy & Co., Youngstown, O., for their celebrated roofing to cover the new mill they built to replace the one burned. The square dealing, superior stock, low price, proximity to the mill, simpleness in construction and applying, are pushing this well known roofing firm to the front. To facilitate and enable them to fill their orders more promptly, they were compelled to locate a factory farther west. The outcome of this is one of the finest plants in the United States, located at Chicago, Ill., containing the latest improved machinery for the manufacture of their standing seam cap roofing, together with corrugated, crimped, beaded and clapboard siding, both iron and steel. When wanting anything in their line, do not fear to address them at either office. See their "ad" in this issue.

The Successful Manufacturer.

The successful manufacturer is not always the one who has the largest capital, a well-equipped plant and a good market for his goods, but the one who has the most extended and practical knowledge of his business.

The head of a large manufacturing concern who, though he may be ever so good a financier, ever so good a manager, ever so well posted on the demands and condition of the markets, is placed at a disadvantage unless he has also a practical knowledge of every part and detail of the plant over which he is placed in control.

It has been very truthfully remarked that the man who can combine the success of a manufacturer with the skill of a mechanic is not always at the head of an establishment. It, however, quite frequently occurs, as is shown by examples of our most successful men, that they have grown up in the business, have evolved from the factory, started in as an apprentice and grown up with the business, gaining a practical knowledge of the work and detail of the mechanical end, as well as a general knowledge of the management of the business. Such a man seldom fails in any undertaking, and if he succeeds to the management of the plant is invariably found to be the right man in the right place.

The school from which most of these men have graduated, is that of the smaller manufactories, for it is here that he may in the course of his apprenticeship, and while working up, have an opportunity of becoming familiar with every department.

The close competition which makes every line of business at the present time one in which the survival of the fittest is every day exemplified, calls for a man as manager who can hold the reins of every department, and be able to see and direct. Economy is the watchword of success, and to practice it requires not only a personal supervision of the general finances, but a watchful knowledge of the details.—[The Manufacturers' Gazette.

A Great Nickel Syndicate.

Word comes from London of the formation of a syndicate for the control of all patents for the production of nickel. The syndicate has been fully constituted, having acquired all the French, English and American rights. It is the purpose of the combination to reduce the cost of steel-making nickel, and this, it is claimed, can be done without interfering with the supply of ordinary nickel used for plating and other manufactures. It is expected that the syndicate will soon erect works near Sheffield for the manufacture of ferro-nickel. Sir James Kitson, the President of the British Iron and Steel Institute, is chair

man of the syndicate, and Sir Lowthian Bell and Percy Gilchrist, the two leading British metallurgists, are among the directors.—[Philadelphia Record.

Homes in the West.

Special through train, April 21st. Across the continent without change of cars! Special cheap rate excursion via the Nickel Plate. Through tourist sleeping cars at nominal expense. Free seats in comfortable reclining chairs to through passengers. Facilities for preparing hot tea and coffee are afforded, and a journey to the Pacific Coast, embracing all the essential features of the "luxuries of modern travel on American railroads," may be enjoyed by passengers holding through tickets, which will be on sale at all ticket offices of the Nickel Plate at lowest rates. Baggage checked to destination. For further information inquire of any agent of the Nickel Plate or B. F. Horner, G. P. A., Cleveland, O.

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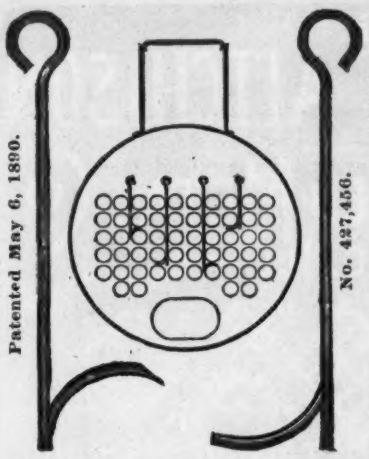
On April 21st, the Nickel plate will run through cars to the Pacific Coast, with no extra charge for seats in chair-cars, to accommodate the many desiring to go to points in Minnesota, Iowa, Missouri, Kansas, Nebraska, The Dakotas, New Mexico, Colorado, Wyoming, Montana, Utah, Idaho, Nevada, California, Oregon and Washington. For information call on or address any agent of the Nickel Plate or B F. Horner, G. P. A., Cleveland, O.

Excursion via Valley Railway to Steubenville, O, April 27 and 28, 1891 State Encampment G. A. R. of Ohio.

The Valley Railway will sell excursion tickets on the above dates, good returning until May 1st, inclusive, at the following low rates: Cleveland, $2 30; Akron, $2.10; E. Akron, $2.10; Canton, $1 55 For further information apply to agents or address J. B. Caden, G. A. R., or J. T. Johnson, Gen'l Supt. Cleveland, O.

THE *Coal Trade*, for 1890, by Mr. Frederick E. Saward, editor of the *Coal Trade Journal* (111 Broadway, New York), is an excellent compendium of the coal industry, containing much information relating to the production, prices and transportation of coal in this country and abroad. It is bound in cloth, and its price is $1. Back numbers of the volume can be obtained for 50 cents per copy.



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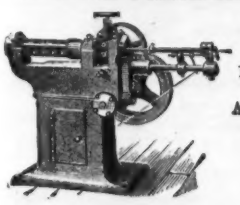

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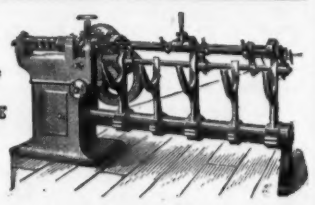

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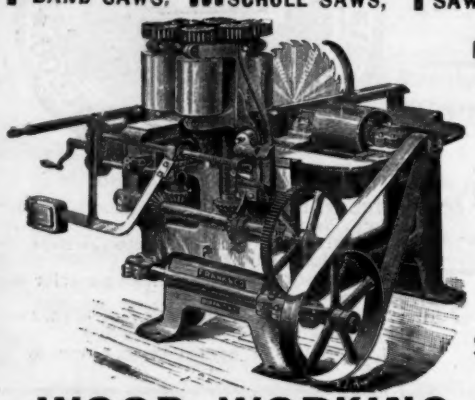

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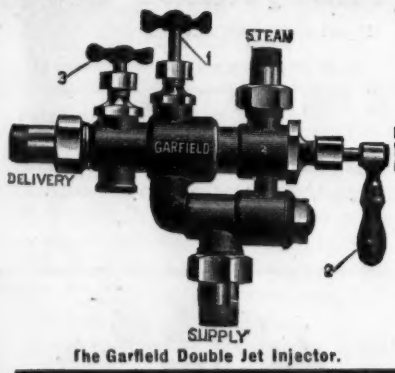

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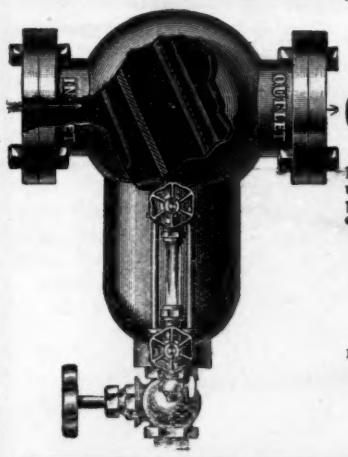

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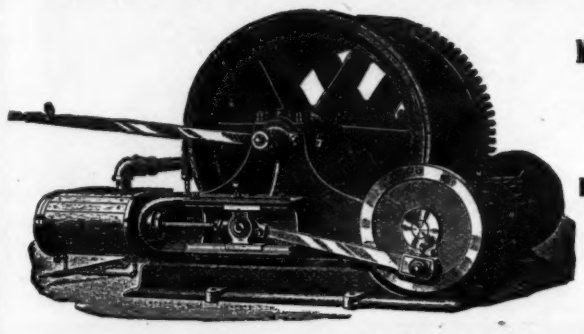

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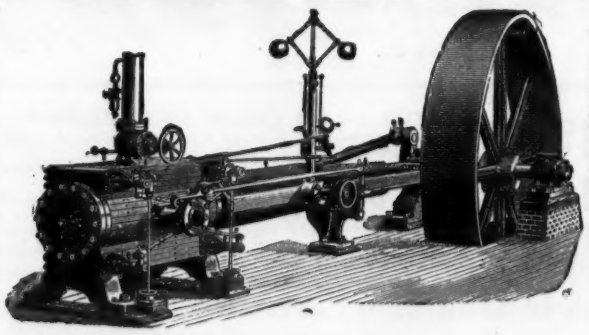

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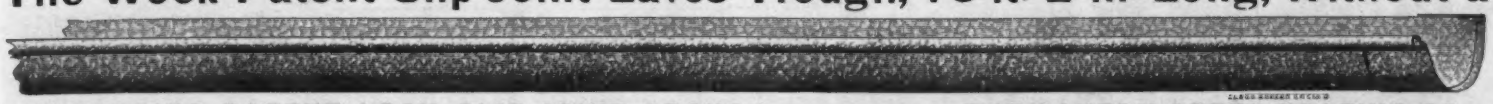

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CINCINNATI (reported by Rogers, Brown & Co.): FOUNDRY IRONS—Southern Coke, No. 1 foundry, $15 00@15 25; Hanging Rock Coke, No. 1 foundry, $16 50@17 50; Jackson Co. Stone Coal, No. 1 foundry, $16 50@17 00; Tennessee Charcoal, No. 1 foundry, $16 50@17 50; Hanging Rock Charcoal, No. 1 foundry, $20 00@22 00. MILL IRONS—Standard Southern Coke, grey forge, $13 25@13 75; Standard Southern Coke, mottled, $13 00@13 25; Cold Short Southern Coke, grey forge, $12 75@13 00; Strong Ohio Neutral Coke, grey forge, $15 00@15 50. CAR WHEEL AND MALLEABLE—Standard Alabama Car Wheel, $20 00@20 50; Tennessee Car Wheel, $18 50@19 50; Lake Superior Car Wheel, $19 50@20 50

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ST. LOUIS (reported by Rogers, Brown & Meacham): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $16 00@16 25; Southern Coke No. 2, $15 00@15 25; Southern Coke No. 3, $14 25@14 75; Southern Grey Forge, $14 00@14 25; Southern Charcoal No. 1, $17 75@18 00; Southern Charcoal No. 2, $17 25@17 50; Missouri Charcoal No. 1, $15 50@16 00; Missouri Charcoal No. 2, $15 00@15 50; Ohio Softeners, $18 00@19 50. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $20 00@20 50; Southern, $19 00@21 00. CONNELLSVILLE COKE—East St. Louis, $0 00; St. Louis, $0 00.

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LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry $14 50@15 00; Southern Coke No. 2 Foundry $13 75@14 25; Southern Coke No. 3 Foundry $13 25@13 75; Grey Forge, $12 75@13 25; Southern Coke Silver Grey, $00 00@00 00; Southern Charcoal No. 1 Foundry, $16 00@17 00; Car Wheel, $17 00@20 00.

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1 & 1¼ by ⅛ to ¼ inch	2 00
⅝, ¼ and ⅞ by ⅛ to ¼ inch	2 20

Round and Square.

1 to 1⅞ inch	1 80
2 to 2¾ inch	2 00
2¾ to 3¼ inch	2 20
3¾ to 4 inch	2 80
4¼ to 4½ inch	3 30
4¾ to 5 inch	3 50

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⅜ to 1¼ inch	2 20
⅜ to ¾ inch	2 40
½	2 60
⅝	3 00

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1¾ to 3 inch	2 90
⅜ to 1¼ inch	2 50
½ to ¾ inch	3 10
⅝	3 30
¾	4 80

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[illegible]	3 80

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1¼ to 4, Nos. 13 to 15	2 60
1¼ to 2, Nos. 16 to 18	2 70
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1¼ to 2, No. 20	2 90
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15-16, 1 and 1¼, Nos. 13 to 15	2 80
15-16, 1 and 1¼, Nos. 16 to 18	2 90
15-16, 1 and 1¼, Nos. 19 and 20	3 00
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⅞, No. 21	3 30
⅞, No. 22	3 40
13-16, Nos. 13 to 15	3 20
13-16, Nos. 16 to 18	3 30
13-16, Nos. 19 and 20	3 40
13-16, No. 21	3 50
13-16, No. 22	3 60
¾, Nos. 13 to 15	3 30
¾, Nos. 16 to 18	3 50
¾, Nos. 19 and 20	3 70
¾, No. 21	3 70
¾, No. 22	3 80
11-16, Nos. 13 to 15	3 50
11-16, Nos. 16 to 18	3 70
11-16, Nos. 19 and 20	3 80
11-16, No. 21	3 90
11-16, No. 22	4 00
⅝, Nos. 13 to 15	3 70
⅝, Nos. 16 to 18	4 00
⅝, Nos. 19 and 20	4 10
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Light Band.

1¼ to 6 by ⅛ to 3-16 in	2 20
1¼ to 6 by Nos. 11 and 12	2 30
1 to 1¾ by ⅛ to 3-16 in	2 40
1 to 1¾ by Nos. 11 and 12	2 50
⅞ and 13-16 by ⅛ to 3-16 in	2 70
⅞ and 1 3-16 by Nos. 11 and 12	2 80
¾ and 11-16 by ⅛ to 3-16 in	3 00
¾ and 11-16 by Nos. 11 and 12	3 10
⅝ and 9-16 by ⅛ to 3-16 in.	3 20
⅝ and 9-16 by Nos. 11 and 12	3 40
½ by ⅜ to 3-16 in	3 60
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Iron Boiler Plates.

Tank, ¼ inch and heavier	2 60
C No. 1, " "	2 85
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Extra Flange, "	4 35
Solid Fire Box "	5 10

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 75
Shell	3 15
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Marine Flange	3 85
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Above includes plates 90 inches wide.

90 to 96 in. wide	½c lb extra
96 to 100 in. wide	1 c "
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American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. lbs
1 to 2 in. inclusive	09
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⅛ to 6 in	11½
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3-6 in	14

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2 to 9-16 wide by 2 to ⅝ thick	8

Bessemer and O. H. Steel.

Machinery	base price,	2 75
Tire	"	2 75
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English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
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⅝, ½, 11-16 and ⅜ inches diameter	4 00
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Wrought turning (free from cast)	12 00
Cast borings	8 00
Uncut wrought iron boilers	11 00
Steel boiler plates	17 00
Grate Bars	8 00
Pipes and flues (Clean)	13 50
Tank iron	13 50
Hoop and band iron	10 00
Sheet iron	9 50
Wrought drillings	11 00
Malleable iron	10 00

Reported by Messrs. BLACK & POLLOCK, Cincinnati, O.:

Railroad Wrought	$20 00
No. 1 Country Wrought	17 00
Stove Plate	8 75
Machine Castings	11 00
Hoop and Sheet	8 00
Casting Borings	9 00
Wrought Turnings	11 00

CLEVELAND ROLLING MILL CO.,

MANUFACTURERS OF

BESSEMER STEEL RAILS,

Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel, Steel Street Rails, Steel Oil Barrel Hoops, Wire of all Kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

THE CAMBRIDGE IRON & STEEL CO.

MANUFACTURERS OF

SHEET IRON AND SHEET STEEL

CAMBRIDGE REFINED IRON TRADE MARK — Squared Roofing Sheets a Specialty — CAMBRIDGE SOFT STEEL TRADE MARK

CAPACITY RANGES FROM No. 30 26 INCHES WIDE TO 1-4×40×120

CORRESPONDENCE SOLICITED — OFFICE AND WORKS CAMBRIDGE, OHIO.

Magnetic Concentration of Iron Ore.

Ball-Norton (Monarch) Electro Magnetic Separator.

Phosphorus, sulphur, silica, hornblende and other impurities eliminated from Iron Ore, and non-Bessemer ore converted into Bessemer Ore. Samples treated without charge. Correspondence solicited.

H. E. COLLINS & CO., Agents Magnetic Separator Co.,

BANK OF COMMERCE BUILDING, PITTSBURGH, PA. ALDRICH COURT, 45 BROADWAY, NEW YORK

DALLIBA, CORRIGAN & CO.,

DEALERS IN

Iron Ore & Pig Iron,

Rooms 716, 717, 718, 719 Perry-Payne Bld'g,

CLEVELAND, O.

OGLEBAY, NORTON & CO.,

Successors to Tuttle, Oglebay & Co.,

Commission Dealers in

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FROM MARQUETTE, GOGEBIC AND MENOMINEE DISTRICTS,

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J. H. OUTHWAITE & CO.,

Exclusive attention given to

LAKE SUPERIOR AND MENOMINEE RANGE

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COMMISSION DEALER IN

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AND METALS.

Cleveland, - Ohio.

Sam'l L. Matner, Prest. & Treas. Fred. A. Morse, Sec'y.

Cleveland Iron Mining Co.,

Dealers in Iron Ores

from their own mines near Marquette, Lake Superior.

Rooms 4 & 5 Mercantile Bank Building,

CLEVELAND O.

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MINERS AND SHIPPERS OF

Ohio Steam Coal and Coke.

Mines on the Cleveland, Lorain & Wheeling R. R. Capacity, 3,000 tons daily.

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CLEVELAND, OHIO.

Lake Shipping Point, Lorain O

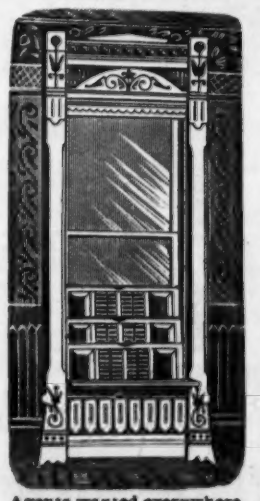
JAS. PATTERSON, Sales Agent.

AULT & WIBORG PRINTING INKS.

CINCINNATI.

A&W INK USED ON THIS PUBLICATION

Hartman's Patent Inside Sliding Window Blind



is the most popular Blind in America. Architects & builders prefer it to any other, for merit, style, convenience and economy.

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HARTMAN & DURSTINE, No. 59 Beaver St. Wooster, O.

MACHINERY SUPPLY MARKET.

Anvils.

American.....₩ lb 9@10
Wrights.....₩ lb 12

Bellows.

Blacksmiths' { Hill's.....dis 40 / Bullock's.....dis 50&10
Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

Belting.

Boston Belting Co's standard.....dis 70
" " " extra.....dis 60&5
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard..dis 60&10
Shults Raw Hide Leather Belting, single.....dis 40
Shults Raw Hide Leather Belting, double, and Light Double.....dis 40
Standard, oak tanned.....dis 50&10
Alexander Brothers' pure oak tanned....dis 45

Blowers and Exhausters.

B. F. Sturtevant's.....dis 20
Boston Blower Co.,.....dis 35
Buffalo.....dis 35

Borax.

.....₩ lb 12

Chalk.

White.....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 85

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers.....dis 30
" Drill.....dis 35
Wescott's Scroll Combination.....dis 33⅓
" Independent.....dis 40
" Little Giant Drill.....dis 30
Horton's Universal.....dis 40
" Independent.....dis 45
Whiton's Independent.....dis 45
National Combination.....dis 40
Sweetland " .....dis 40
Almond Drill.....dis 20
Morse " .....dis 15
Skinner's Combination Lathe.....dis 33⅓
" Independent Lathe.....dis 40
" Universal Lathe.....dis 40
" Drill.....dis 15

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
" Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3½

Drill and Drill Sockets.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1¼".....dis 50&10
Morse Taper and Straight shank Larger than 1¼".....dis 25
Drill Sockets.....dis 25
Standard Twist Drills.....dis 55@55&5
Cleveland " " .....dis 55@55&5

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. F. FF.
Kegs, ₩ lb	4 c	5 c		2½c
½ kegs ₩ lb	4½c	5½c		3½c
¼ kegs ₩ lb	4¾c	5¾c		3 c
10 lb cans, 10 in case	6 c	6½c		5 c
10 lb cans, less than 10	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 45@50
H. H. Barton.....dis 50@50&10

Emery Wheels.

Detroit.....dis 55@60
Norton's.....dis 55@60
Grant.....dis 55@60
Sterling.....dis 60
Celluloid.....dis 10&33⅓
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60
Vulcanite.....dis 10&10

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
Industry File Works, hand cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¾	4	3½	2⅝
Hexagon	15½	11⅛	8¾	6	5¾	5⅛	5
Washers	9	8	7	5	4½	4⅛	4⅛

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire.

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate { Car lots.....$2.30 / Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 13@14
Plumbago Piston.....₩ lb 40
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 50
Sheet Rubber.....₩ lb 12&24
Excelsior Rubber.....₩ lb 48

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 50@55

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ¾ inch and over.....₩ lb 15¼
Sisal, ¾ inch and over.....₩ lb 13½

Sand Paper.

B. A. & Co.....dis 45@50
H. H. Barton's.....dis 40@45
New England Flint.....dis 40@50
Barton's Garnet.....dis 20

Saws.

Disston's Circular.....dis 40@45
" Band.....dis 30
" Scroll.....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 30
Atkins' Cicular Saws.....dis 40&45
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 33c "
No. 1 Handles.....dis 23c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay.....dis 45

Screws.

Wood Screws—New List 1850.

Flat head iron.....dis 42&10
Round head iron.....dis 40
Flat head brass.....dis 45
Round head brass.....dis 35
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 65
Machine, round head, iron.....dis 60
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ⅛ lb Balls	21c@29c	
No. 18 " " ¼ and ⅛ "	18c@28c	
No. 36 " " ¼ and ⅛ "	16c@27c	
2-Ply Hemp, ¼ & ⅛ lb Balls (Spring Twine)	11½c	
3-Ply " 1 lb Balls	12@12½c	
3-Ply " 1¼ lb Balls	11@11½c	
Cotton Wrapping, 5 Balls to lb	15@16c	

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 15

Wire.

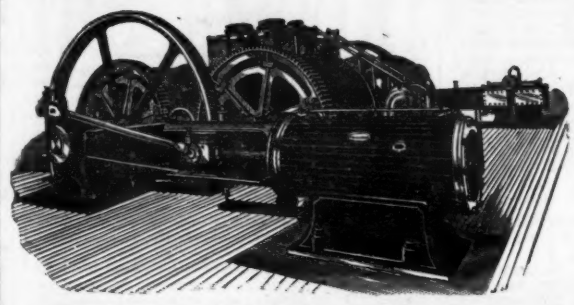
New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....$6.00@lb dis 5

Wrenches.

Coe's genuine,.....dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10.& 5
Bemis & Call's Combination.....dis 50
Donohue's Engineers.....dis 20& 10
Lamson & Sessions Engineers.....dis 25
Billings & Spencer's Drop Forged.....dis 25
" " " .....dis 25
William's " " .....dis 25
Alligator " " .....dis 50

Webster, Camp & Lane Machine Co.



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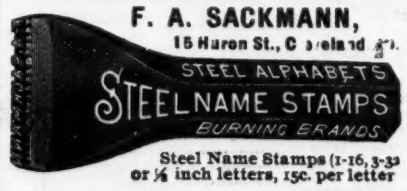
Mining Machinery,
Improved Band Friction Hoisting Machinery, Geared or Direct Acting, for round or flat rope.
Wire Rope Haulage Machinery.
Endless or Tail Rope Systems.)
CORNISH PLUNGER AND BUCKET LIFT PUMPS.
Automatic or Slide Valve Steam Engines, Sheaves, Cages, Buckets, Etc.
Send for Catalogue D. 134 N. Main St., AKRON, OHIO.

BOSTON BELTING CO.
ESTABLISHED 1828.
Oldest and Largest Manufacturers
In the world.
VULCANIZED RUBBER GOOD.
For Mechanical purposes.
256-260 DEVONSHIRE STREET,
BOSTON.

100 Chambers St., New York.
161 to 165 W. Pearl St., Cincinnati, Ohio.
148 to 150 Water St., Cleveland, Ohio
109 Madison St., Chicago, Ill.

THE THOS. D. WEST FOUNDRY CO.
CLEVELAND, O.
LIGHT AND HEAVY
IRON CASTINGS.
DAILY MELTING CAPACITY 75 TONS—SPECIAL FACILITIES FOR ECONOMICALY TURNING OUT SMOOTH CLEAN CASTINGS.
DUPLICATE WORK A SPECIALTY



F. A. SACKMANN,
15 Huron St., Cleveland, O.
Steel Name Stamps (1-16, 3-32 or ¼ inch letters, 15c. per letter

SECTION OF CONVEYOR.

Detachable Roller and Chain Belting,
MADE IN ALL SIZES OF
Malleable Iron and Steel,
DESIGNED FOR
Elevators, Conveyors, Drive Belts, etc.
For handling materials of all kinds.
Send for Illustrated Catalogue. Address
The Jeffrey M'f'g Co.,
183 East 1st Ave.,
COLUMBUS, O.

CHAIN.

Patent Milled or Turned Shafting
Is rapidly coming to the front.
Made only by
The Brightman Machine Co.
CENTER ST. FROM MAIN TO WINSLOW,
CLEVELAND, O.

DON'T USE poor printing when you can get the best at the same prices, of the CLEVELAND PRINTING & PUBLISHING CO., Cleveland, O.

UNION ELECTROTYPE FOUNDRY
TELEPHONE 2139
829 SHERIFF ST. CLEVELAND, O.

THE INDISPENSABLE LATHE DOG.
THE INDISPENSABLE LATHE DOGS can be attached to work after the work is centered in the lathe. They can be used equally as well BETWEEN COLLARS AS upon plain or straight work.
DROP FORGED FROM BAR STEEL.

No. 1 takes from	¼	to	1¼	inches, price, each.....$1 50
" 2 "	½	to	2¼	" " 2 50
" 3 "	1	to	3¼	" " 3 50

Price, per set of three, to take from ¼ to 3¼ in. 7 50
PALMER, CUNNINGHAM & CO., L't'd,
607 Market St., PHILADELPHIA, PA.

IRON FOUNDRY CANTON IRON FOUNDRY CO.,
Canton, Ohio.
HEAVY AND LIGHT CASTINGS.
Privilege to make estimates solicited.

THE BRIGHTMAN STOKER IS THE BEST
STEAM BOILER FURNACE IN THE WORLD.
SEND FOR DESCRIPTIVE PAMPHLET. THE BRIGHTMAN STOKER Co. 201-203 RIVER ST. CLEVELAND, OHIO.

HARDWARE MARKET.

Augers and Bits.

Common augers and bits.....dis 70
Snell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ₩ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ₩ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $3 25@4 00
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....₩ doz $8 00
Others.....₩ doz $7 00
Full polished.....₩ doz $9 00

Bolts.

Cast iron barrel bolts.....dis 70
Cast iron shutter bolts, etc.....dis 70
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70
Wrought iron square bolts.....dis 70
Wrought shutter bolts.....dis 60&10

Sargent's list
Carriage, common, new list.....dis 75&10
Tire, common, new list.....dis 65
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 60
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 75&10
Cast brass, loose joint.....dis 33⅓
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60
Fast joint, broad.....dis 50&10@60
Loose joint.....dis 70&10
Loose joint, jap.....dis 70&10
Loose joint, jap. with acorns.....dis 70&10
Loose pin, acorns.....dis 70&10
Loose pin, japanned acorns.....dis 70&10
Loose pin, acorns, jap. plated tips.....dis 70&10
Wrought steel—
Wrought, fast joint, narrow.....dis 70&10
Wrought, fast joint, broad.....dis 70&10
Wrought, loose joint, broad.....dis 70&10
Table Butts, back flaps, etc.....dis 70&10
Regular inside blind.....dis 70&10
Light inside blind.....dis 70&10
Loose pin.....dis 70&10
Light loose pin.....dis 70&10

Carbonized Felt and Building Papers.

(POWERVILLE BRAND.)

	Per roll of 500 sq. feet.
Eberts Bros., Detroit.	
No. 1—Slaters'.....	$1.25
"A," Stringed Roofing, Light.....	1.50
"B," Stringed Roofing, Medium.....	1.75
"C," Stringed Roofing, Heavy.....	2.00
Stringed, Rosin-Sized.....	1.00

MILCELLANEOUS.

Asphaltum, Trinidad Refined, ₩ ton.....	$30.00
Asphaltum, Fine Grade, ₩ lb.....	.08
Coal Tar Felt, 1 Ply, ₩ lb.....	.02
Coal Tar Felt, 2 Ply, ₩ roll 108 sq ft.....	1.42½
Coal Tar Felt, 3 Ply, ₩ roll 108 sq ft.....	1.85
Roofing Pitch, ₩ gal.....	.09

Chains.

Revised List.
Trace, 6½-10-2.....₩ pair 1.03
Trace, 6½-10-3.....₩ pair .92 } .....50&10
Trace, 7-10-2.....₩ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887.....dis 50&10@60
Galvanized Pump Chain.....₩ lb 5¼@6
Jack Chain, Iron.....dis 75&10
Jack Chain, Brass.....dis 75

Chisels.

Socket Framing and Firmer.....dis 75
Socket Framing and Firmer, Buck Bros..dis 50
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Fibre Ware—Standard.

	Nos. 1	5.	5X.
Pails, water, 12 qt.....	$4 00	$4 50	$.....
Dairy, 14 qt.....	4 50	5 00	.....
Fire 12 qt.....	5 00	.....	.....
Sugar.....	6 00	6 50	.....
Horse.....	.....	5 00	.....
Buggy.....	4 00	.....	.....
Chamber, Slop, Commode } 5 and 5X 14 qt.....	6 50	7 50	8 50
Urns, slop, 5 and 5X 14 qt.....	8 00	9 00	10 00
Basins, wash—			
10½ inch.....	2 00	2 25	.....
12 inch.....	2 25	2 75	3 25
13½ inch.....	2 75	3 25	3 75
15 inch.....	3 25	3 75	4 25
Bowls, fruit.....	.....	2 50	.....
Servers, 12 in.....	.....	2 25	.....
Baskets, waste paper, 13 in.....	.....	6 00	.....
Spittons, "Daisy," pressed			
8 inch.....	4 00	4 50	5 00
10 and 11¾ inch.....	6 00	6 50	7 50

No. 1 plain; No. 5 decorated; No. 5X White corated.

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....₩ gross $12, dis 25@25&5

Hanger

Barn door, old patterns.....dis 00&10&10@70
Climax, (Anti-Friction).....dis 60
Scranton.....dis 33—
Kidder's.....dis 50&10@60
Terry's Patent.....3 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 40&10
Richard's.....dis 30@30&10

Horse Nails.

No.	10	9	8	7	6	
Ausable, ₩ lb.	23	24	25	26	28	dis 40
Putnam, ₩ lb.	18	19	20	21	23	dis 15
Essex						dis 25&10

Horse Shoes.

Burden, at factory.....₩ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....₩ keg $4 00
Mule Shoes, at factory.....₩ keg $5 00

Knobs.

Carriage, japanned.....₩ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hematite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65c@68c
Door Por. japanned.....dis 75c@78c
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbin, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60&10
Escutcheons and keys.....dis 60&10
Padlocks and padlock keys.....dis 75
Bell pulls, mineral, porcelain and jet dis 60&10
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps, genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 70
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓
Bishop's Buckeye Sash Locks.....₩ gross $4.80

Plumbs and Leves.

Standard list.....dis 70&10
Pocket levels.....dis 70&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@60
Pitcher spout, best makers dis 60&10@60&10&10
Pitcher spout, cheaper goods.....dis 70@70&5

Pokes, Animal.

Bishop's I. X. L.....₩ doz $6 00
Bishop's O K.....₩ doz $5 25
Bishop's Pioneer.....₩ doz $3 75
Bishop's American.....₩ doz $2 75

Rakes.

Cast steel.....dis 70
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher.....$10@[illegible]...dis 10
Rifle razor.....dis $9 50 net

Rat Killers.

Schuyler's.....₩ gross $15 00

Scales.

Hatch, Counter, No. 171.....₩ doz $21 00
Hatch, Tea, No. 161.....₩ doz $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....₩ doz $18 dis 25

Squares.

Steel and iron, Nickel plated } dis 75&10@80
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 50&10

Tacks, Brads, Etc.

New List, Oct. 19, 1890.
American iron carpet tacks all kinds dis 77⅓&10
Steel carpet tacks all kinds.....dis 75&10
Swedes iron carpet tacks, all kinds dis 75&10
Swedes iron tacks.....dis 75&10
Swedes iron Upholsterers' tacks.....dis 75&10
Tinned Swedes iron tacks.....dis 77⅓&10
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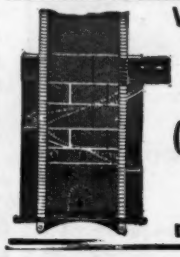

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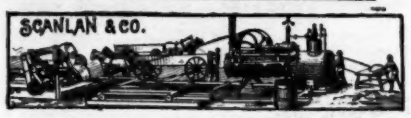

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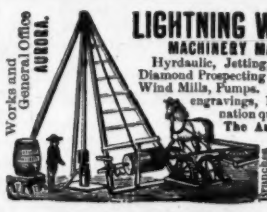

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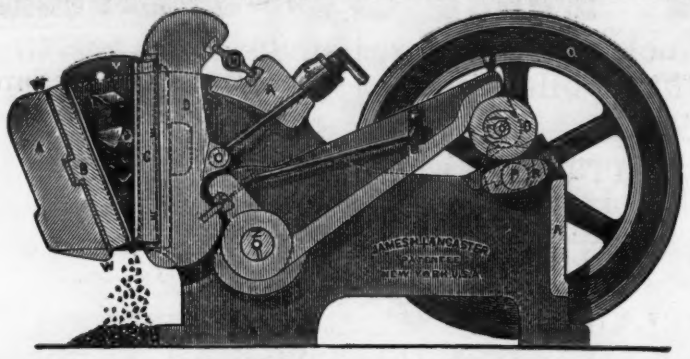

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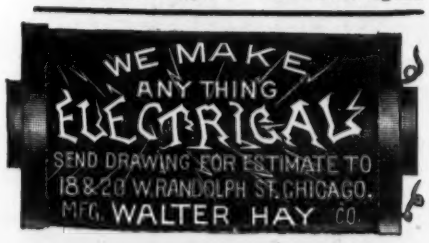

TRAVELERS' REGISTER.

Standard Time.

Erie Railway.

Depot, South Water Street and Viaduct.

	Arrive.	Depart.
N. Y. & Pitts. Express	‡5 38 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommo		†6 40 a m
Pittsburgh Express	†6 25 p m	
Youngstown Local	†8 05 a m	
Mahon'g div. & Pitts Local		*11 40 a m
Mahoning Val. Accom		†4 30 p m
Pittsburgh Express	‡1 20 p m	11 10 p m
New York Express	*8 00 p m	

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

(Standard Gauge.)

Depart for—

Zanesville and Coshocton—6:50 a. m., 3:00 p. m.
Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.

Arrive from—

Zanesville and Coshocton—10:30 a. m., 6:30 p. m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m., 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p. m., 7:10 p. m.

Trains marked * run daily.

Valley Railway.

FOR AKRON, CANTON AND MARIETTA.

Depot oot South Water Street.

	Depart.	Arrive.
Valley Junction Mail	*7 25 a m	*6 40 p m
Marietta Express	†11 15 a m	†2 35 p m
Bal'o. & Wash. Express	*4 00 p m	*10 25 a m
Cleve. and Canton Express	†6 30 p m	†8 15 a m

*Daily. †Daily, except Sunday.

J. T. JOHNSON, Gen. Supt. J. B. CAVEN, Gen. Pass. Agt.

From Cleveland Union Station.

PENNSYLVANIA LINES.

Cleveland & Pittsburgh R. R.

	Depart.	Arrive.
For Pittsburgh, Baltimore, Washington, Philadelphia and New York.	7 45 a m	d5 25 a m
	1 15 p m	12 50 p m
	d11 10 p m	6 35 p m
Wheeling and Bellaire.	7 45 a m	12 50 p m
	1 15 p m	6 35 p m
	*11 10 p m	.....
Alliance Accom.	3 25 p m	10 10 a m
Ravenna Accom.	5 00 p m	8 25 a m

d Daily. * Except Saturday. Other trains except Sunday.

From Cleveland Union Station.

Mt Vernon and Pan Handle Route

Cleveland & Pittsburgh R. R.

	Depart.	Arrive.
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon, Columbus, Xenia, Dayton, Cincinnati, Louisville, Indianapolis, St. Louis, and all points in the South and Southwest.	8 00 a m	d 7 00 am
	d 8 00 p m	5 40 p m
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon and Columbus.	1 15 p m	12 50 p m
For Cuyahoga Falls, Akron, Orrville, Chicago, and all points in the West and Northwest.	8 00 a m	5 40 p m
	3 25 p m	10 10 a m

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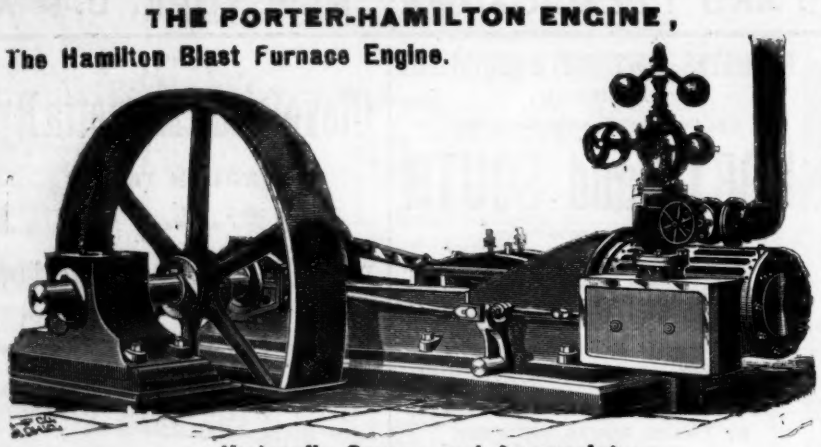

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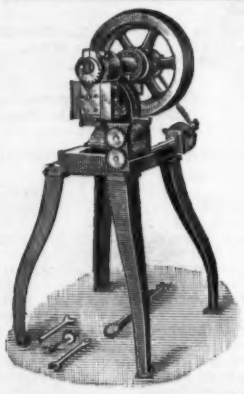

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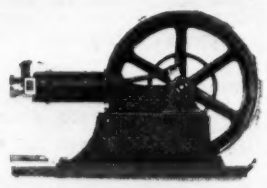

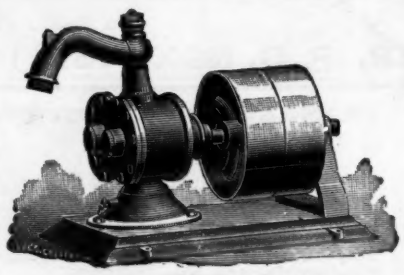

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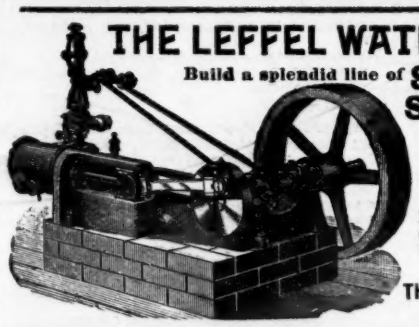

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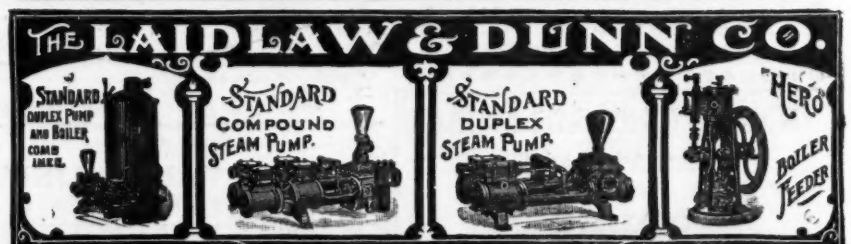

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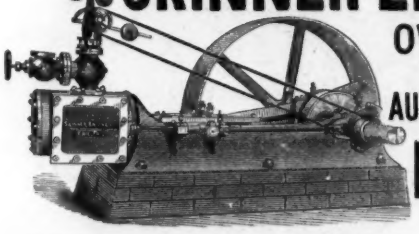

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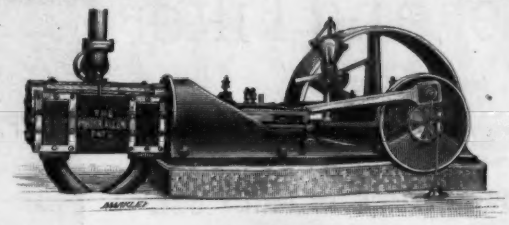

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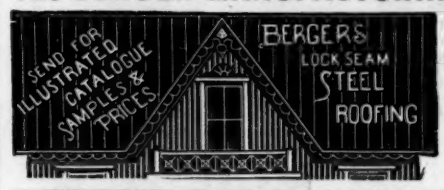

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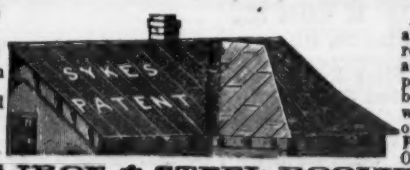

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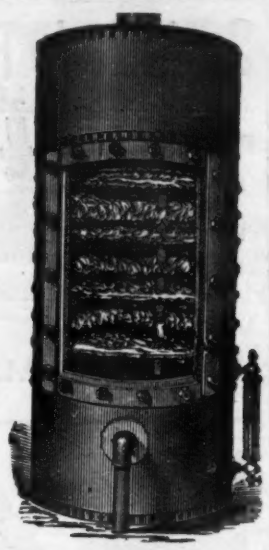

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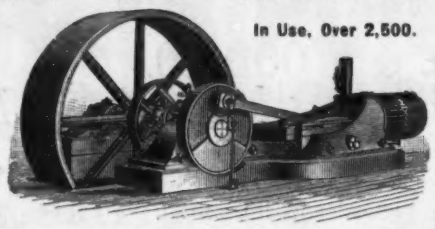

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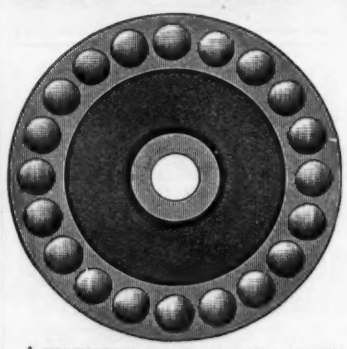

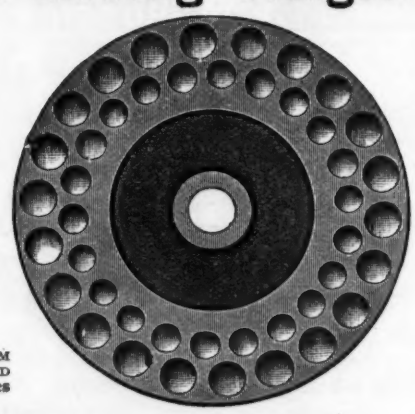

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